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ABSTRACT

Because Oregon has witnessed dramatic growth and interest in vocational education in the last 10 years as schools began implementing vocational education at an accelerated rate, the primary purposes of the project were to strengthen and expand applied research efforts in the areas of manpower analysis, counseling and guidance, and curriculum development. The project provided a means to further the development of a "data base system" in Oregon with components related to manpower and curriculum development. It also provided for the completion of the Career Program Planning System (CPPS) in Oregon. With CPPS completed, Oregon is able to identify occupational needs for some 2,800 occupations in 18 major occupational areas. These areas include agriculture, marketing, health, food service, accounting, clerical, steno-secretarial, industrial mechanics, construction, electricity-electronics, metals, child care, clothing, institutional and home management, drafting, graphics, service occupations, and forest products. The development of CPPS also has provided a means to assign the number of trained vocational graduates to specific clusters and related U.S. Office of Education (USOE) instructional program areas. (This report describes project design and procedures and lists conclusions and recommendations. Half of it consist of appendixes: Sample task analysis, task analysis procedures, task analysis questionnaire, learner module cover format, guidelines for module format, sample module, sample work experience training plan, and miscellaneous tables.) (WL)

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FINAL REPORT

Project No. V0066VZ
Grant No. OEG-0-74-1723

A STATEWIDE MANPOWER/CURRICULUM MANAGEMENT SYSTEM

Research Project in Vocational Education
conducted under
Part C of Public Law 90-576

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
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DEFINITIONS

DICTIONARY OF OCCUPATIONAL TITLES (D.O.T.).....A two-volume publication of the U.S. Department of Labor. One volume contains the titles and definitions of 35,550 occupations in the U.S. The other volume groups the jobs by occupational, industrial, or worker characteristics to help the user see relationships among occupations and to classify the abilities, vocational experiences and potentials of workers.

EXFLORATION.....Provide students with opportunities to better understand themselves and the knowledge, skills, technical requirements, working conditions and political and social relaties of each of the career fields that interest them.

GOAL.....A broad statement of instructional intent. Usually characterized by vague words as understand, know, appreciate, etc. Example: Students will be able to apply a general knowledge of construction techniques.

INDUSTRIAL EDUCATION.....A general term applying to industrial related education, including Industrial Arts, Vocational Industrial (Trade and Industrial), and Technical Education.

INSTRUCTIONAL ANALYSIS.....A process of (a) grouping knowledge and skills, (b) identifying expected student behaviors, (c) organizing knowledge requirements, (d) organizing classroom activities, (3) determining scope and sequence of curriculum.

INSTRUCTIONAL CONCEPT.....A generalized idea of the composite skills and knowledge to be taught.

KEY OCCUPATIONS.....Jobs in which 250 or more are employed and in which a five-year expansion/replacement need of 100 or more over a five-year period can be shown.

PERFORMANCE INDICATOR.....A description of observable student performance which takes place within a prescribed setting (under specific conditions). Does not include a criterion. Example: Given a lab exercise the student will be able to use an electric hand power saw, drills and router.

PREPARATION.....Through the career cluster concept, students are given the opportunity to gain basic skills and knowledge related to a broad occupational area rather than to one occupation.

RELATED OCCUPATIONS.....Jobs in which 100 or more persons are employed in Oregon and among which similarities can be found.

TASK.....Any function a worker performs within a specific, continuous period of time and which results in an end product.

TASK INVENTORY.....A list of the duties and functions of a specific occupation which a worker performs in order to successfully hold the job.

VOCATIONAL EDUCATION.....A component of career education which offers specific skill training in a wide variety of subtechnical, technical and subprofessional skills, which prepares individuals for gainful employment, and which may continue through skill upgrading or retraining for a new job.

WORLD OF WORK.....All existing job titles shown in the Dictionary of Occupational Titles.

CHAPTER I
INTRODUCTION

TIME PERIOD COVERED BY THE REPORT

This report is the final report for the total project covering the time period of July 1, 1974, to December 31, 1975.

Traditional vocational education programs have undergone change and revision and have assumed an increased significant role in the total educational process. Oregon has witnessed dramatic growth and interest in vocational education in the last ten years as schools have begun implementing vocational education at an accelerated rate.

Due to this new vocational emphasis and the related enrollment increases, great need had arisen in Oregon education for the development of more accurate and complete manpower and occupational data and related instructional materials for purposes of vocational program planning, curriculum development and guidance.

In response to the foregoing needs, it was critical that development of the identified components of the manpower/curriculum management system, as described in the original proposal, be completed and the necessary data compiled and placed in that system as soon as possible.

GOALS AND OBJECTIVES

The primary purposes of the project were to strengthen and expand applied research efforts in the areas of manpower analysis, counseling and guidance and curriculum development.

The Broad goals of the Project were to:

(1) provide for the development, refinement and use of manpower data for program planners, curriculum development and guidance and counseling;

(2) create a data base through occupational task/competency/instructional analysis for purposes of program planning, curriculum development and guidance; and

(3) provide models for utilization of data in curriculum development with emphasis on individualized instruction, work experience and student assessment.

The Specific Objectives were:

(1) To complete development of a computerized system for organization and dissemination of manpower data.

1.2 Add additional manpower data to the system and verify existing data.

2.1 Complete task analyses in priority occupational areas.

2.2 Identify common core competencies in priority occupational cluster areas.

2.3 Develop dissemination procedures for task/competency analyses.

2.4 Develop criteria-based performance objectives for identified tasks and competencies.

3.1 Develop alternate designs for individualized instructional materials based on identified objectives.

3.2 Provide a basis for establishing specifications for work experience programs.

3.3 Provide procedures for assessing students for placement in occupational training programs or employment.

3.4 Refine field test procedures for evaluation of instructional materials.

RESULTS AND ACCOMPLISHMENTS:

The project was significant in that it provided a means to further the development of a "data base system" in Oregon with components related to manpower and curriculum development.

The project was instrumental in providing for the completion of the Career Program Planning System (CPPS) in Oregon. With CPPS completed, Oregon now is able to identify occupational needs for some 2,800 occupations in 18 major occupational areas. These areas include agriculture, marketing, health, food service, accounting, clerical, steno-secretarial, industrial mechanics, construction, electricity-electronics, metals, child care, clothing, institutional and home management, drafting, graphics, service occupations and forest products. The development of CPPS also has provided a means to assign the number of trained vocational graduates to specific clusters and related USOE instructional program areas.

The project was also instrumental in enhancing the development of an occupational base for curriculum development in Oregon. Through the project Oregon was able to compile or develop numerous occupational/task analyses, occupational competencies and learner modules which otherwise would have taken a longer time period to obtain. Through the project Oregon was also able to develop a data processing system for compiling and sorting occupational tasks so that common competencies may be derived based on common characteristics of tasks.

CONCLUSIONS AND RECOMMENDATIONS:

Manpower demand systems must be revised at least every two to three years if they are going to be helpful to program planners. Periodic updates insure that new programs are started only when current employment and forecasted job opening estimates justify the new programs. The updated demand information also is instrumental in monitoring the impact of existing vocational programs on the labor market.

The supply component of most manpower systems, including CPPS, is most often the weakest link. This need not happen. Such weaknesses can be reduced by an all-out effort to identify the various supply sources and obtain accurate information of the numbers of trained people available from these sources.

Once the new Federal-State Occupational Employment Statistics (OES) Program is operational it is recommended that special effort be made to identify new and emerging occupations. In this way attention can be given to considering new programs in these areas. It is also recommended that the Oregon Department of Education and the Oregon Employment Division pursue the development of a manpower supply model that will more accurately identify trained graduates and workers who may fill existing labor market needs.

After half of the project had elapsed, it became apparent that some of the proposed objectives were too progressive, in view of the time it took to complete some of the activities. For instance, it was projected that 60 occupational/task analyses would be completed during the eighteen months of the project, however, only 38 were actually completed. The reason for this is that we found it actually took on the average of three months to complete a single occupational/task analysis. This included contracting with a person presently working in the occupation which needed to have a development of an analysis, reviewing the individuals work and working with a screening committee of persons presently in the occupation to determine the validity of the analysis.

CHAPTER II

PROBLEM AREA, SPECIFIC GOALS, OBJECTIVES AND ACTIVITIES

PROBLEM AREA

Due to a new vocational emphasis and related enrollment increases, great need had arisen in Oregon education for the development of more accurate and complete manpower and occupational data and related instructional materials for purposes of vocational program planning, and curriculum development. Two major areas requiring immediate development were.

1. High School Cluster Preparation Curriculums; Detailed manpower analyses were required to determine the need for additional programs in existing cluster areas and to identify new occupational cluster areas. In addition, these analyses provided date for career guidance and identification of priority occupational areas for curriculum development. Occupational analyses and associated instructional analyses had to be completed to establish a base for the development of cluster core curriculum materials.

2. Specialization (Post-High School) Curriculums; As the number of these programs proliferated it became essential that accurate occupational manpower demand/supply data be available to help in planning and to overcome problems of program overlap and oversupply in some occupational areas. Again, as at the high school level, occupational task and instructional analyses had to be completed in identified priority occupational areas so that the curriculum development process was valid and relevant to industry needs.

As comprehensive career education programs are implemented in the elementary and intermediate grades, emphasis is being placed on vocational offerings which will meet a wide variety of student needs. If vocational programs are to meet the demands being placed on them, they must be able adapt the instruction and curriculum to the individual by having available appropriate and validated individualized curriculum materials. This is particularly true in post-secondary and adult preparatory programs. To expedite this process to provide for maximum instructional efficiency and to help eliminate duplication in student learning experiences two key requirements appear to be necessary: (1) have the instruction based on the developing student competencies in priority occupational areas, and (2) identify competencies that occur in more than one occupation.

In response to the foregoing needs, it was critical that development of the identified components of the manpower/curriculum management system be completed and the necessary data compiled and placed in that system as soon as possible.

GOALS AND OBJECTIVES OF THE PROJECT

The primary purposes of the project were to strengthen and expand applied research efforts in the areas of manpower analysis, counseling and guidance and curriculum development. More specifically, the goals for the project were: (1) provide for the development, refinement and use of manpower data in program planners, curriculum development and guidance and counseling; (2) create a data base through occupational task/competency/instructional analysis for purposes of program planning, curriculum development and guidance; and (3) provide models for utilization of data in curriculum development with emphasis on individualized instruction, work experience, and student assessment. A detailed breakdown of the objectives and activities related to each of these goals is as follows:

1. GOAL - Provide for the development, refinement and use of manpower data in program planning, curriculum development and guidance and counseling.

    1.1 OBJECTIVE - Complete development of a computerized system for organization and dissemination of manpower data.

    ACTIVITIES

    1.1.1 Complete development of Career Program Planning System (CPPS) System.
    1.1.2 Implement use of system and data in field.
    1.1.3 Provide in-service training in use of the system, and manpower data contained in the system, for program planners, curriculum developers, teacher educators and counselors.
    1.1.4 Develop methods and procedures for assessment and evaluation of manpower data and dissemination system.

1.1.5 Refine system according to evaluation.
1.1.6 Provide data for assisting student placement based on manpower demand/supply and follow-up studies.

1.2 OBJECTIVE - Add additional manpower data to system and refine and verify existing data.

ACTIVITIES

1.2.1 Refine existing manpower demand projections through consultation with industrial advisory groups.
1.2.2 Identify priority areas for program and curriculum development in new and emerging occupational areas.
1.2 3 Refine existing manpower supply data through utilization of data from:

1. student follow-up studies
2. refined student enrollment studies
3. reporting identification of other organized manpower training programs; e.g., armed forces, private schools.

2. GOAL - Create a data base, through occupational task/competency/instructional analysis in priority occupational analysis in priority occupational areas, for purposes of program planning, curriculum development and guidance.

2.1 OBJECTIVE - Complete task analysis in priority occupational areas.

ACTIVITIES

2.1.1 Complete 60 task analysis.
2.1.2 Validate each analysis with an industrial advisory committee.
2.1.3 Utilize and refine task analysis procedures.

2.2 OBJECTIVE - Identify common core competencies in priority occupational cluster areas.

ACTIVITIES

2.2.1 Refine and test existing competency derivation process.
2.2.2 Derive competencies in six occupational cluster areas.

2.3 OBJECTIVE - Develop dissemination procedures for task/competency analysis.

ACTIVITIES

2.3.1 Design and test computerized and manual task/competency retrieval dissemination system.
2.3.2 Place task/competencies developed into the system.
2.3.3 Provide in-service training for utilization of task/competency analysis by program planners, curriculum developers, teacher educators and counselors.

2.4 OBJECTIVE - Develop criteria-based performance objectives for identified tasks and competencies.

ACTIVITIES

2.4.1 Refine procedures for development of instructional objectives for competencies based on occupation tasks.
2.4.2 Derive instructional objectives for common core competencies in four occupational clusters.
2.4.3 Derive instructional objectives for post-secondary instruction based on identified tasks in 25 specific occupations.
2.4.4 Disseminate objectives to curriculum developers.

3. GOAL - Provide models for utilization of data in curriculum development, work experience and student assessment.

3.1 OBJECTIVE - Develop alternate designs for individualized instructional materials based on identified instructional objectives.

ACTIVITIES

3.1.1 Identify instructional need of different categories of students.
3.1.2 Identify instructional objectives for disadvantaged and handicapped students.
3.1.3 Design and test special individualized instruction materials for disadvantaged and handicapped students.

3.2 OBJECTIVE - Provide a basis for establishing specifications for work experience programs.

ACTIVITY

3.2.1 Design a model for utilizing task/competency analysis and instructional objectives in developing work experience training agreements.
3.2.2 Identify needs and design a model for adapting existing individualized instructional materials for use in work experience programs.

3.3 OBJECTIVE - Provide procedures for assessing students for placement in occupational training programs or employment.

ACTIVITIES

3.3.1 Develop student assessment model based on task/competency analysis and instructional objectives.
3.3.2 Provide for dissemination of models to teachers and counselors.

3.4 OBJECTIVE - Refine field test procedure for evaluation of instruction materials.

ACTIVITIES

3.4.1 Review and evaluate existing instruments and procedures for field testing instructional models.
3.4.2 Provide for appropriate revision.

CHAPTER III

PROJECT DESIGN AND PROCEDURES FOLLOWED

The Career and Vocational Education Section of the Oregon Department of Education recognizes the importance of using manpower information when planning career and vocational programs in secondary schools and community colleges. One method used to accomplish this in Oregon is to organize occupations into career clusters having common competencies. This concept requires that all occupations included in the cluster have a significant number of commonly required skills and abilities to perform the tasks associated with each occupation. A worker who possesses a competency has the ability to perform effectively the tasks under consideration, including those that are cognitive, psychomotive, and affective.

In Oregon, eighteen such clusters have been identified as having potential for implementation into the public schools and community colleges. The cluster structure implies that career education should prepare students for entry into an "area" or "family" of occupations rather than a specific job. This approach is intended to help students avoid premature commitment to a narrow speciality of work, and, at the same time, provide them with entry-level competencies for a broad base of occupations. In addition, career cluster education is intended to qualify students for subsequent enrollment in more concentrated and specialized training in post-secondary levels of education.

Before a cluster is officially recognized by the Oregon Board of Education,it must have been identified as having general merit for public educational programs and financial support; the composit occupations within the cluster must include a minimum employment of 10,000 people in the state; and indicate a need for a minimum of 2,000 or more employees to meet five-year expansion and replacement forecasts. BECAUSE OF THE REQUIREMENT FOR A LARGE EMPLOYMENT BASE AND FORECASTED NEED, CAREER CLUSTERS DO NOT ENCOMPASS THE ENTIRE OCCUPATIONAL SPECTRUM.

The clusters are used primarily as a way of organizing curriculum for career and vocational training in grades 11 and 12 and post-secondary training in community colleges. Focus has been almost exclusively on occupations which do not require a four-year college degree because of the funding restrictions set down by the U.S. Office of Education, the primary funding source for career and vocational programs in Oregon.

Prior to 1971 no systematic method had been used to identify the occupations belonging to a specific career cluster. Beginning in the fall of 1971, however, the decision was made to identify in a systematic manner all the possible occupations that could be classified under each of the 18 cluster areas. A manpower analyst was hired to identify the vast array of occupations suspected in each of the competency-based career clusters currently approved and recognized by the Oregon Board of Education.[1] The five remaining occupational areas not yet approved by the Department also were to be developed. These included those occupations in drafting, graphics, child care, clothing (fabrics), and institutional and home management.

MANPOWER ANALYSIS

Manpower analyses of the 18 major occupational areas were commenced in the latter part of 1971. The purpose of the comprehensive effort was to provide detailed occupational job title profiles, related statewide and local district employment estimates, projected need estimates for a five-year period, and training institute output (supply). The data would then be used in the decision-making process for reviewing and implementing new programs and the extension and/or curtailment of existing career education programs at the exploratory (junior high school), preparation (high school), and specialization (post-secondary) levels. Other objectives of the manpower analyses were to identify the key occupational areas for task analysis and curriculum development activities, as well as the provision of the data for assisting students in their career guidance and placement activities.

PROCESSES USED TO IDENTIFY THE OCCUPATIONS

The initial selection of occupations in each specific cluster area included identifying those occupations which appeared to have common competencies. The selections were tentatively validated by those having a working knowledge of the occupations. The final decision about the occupations related to a specific competency base were to be made only after detailed task analyses of them had been made. Steps in the initial selection process included the following:

---

[1] Career clusters presently approved by the State Board of Education include those for agriculture, marketing, health, food service, accounting, clerical, stenographic-secretarial, industrial mechanics, construction, electricity-electronics, metals, service, and forest products.

1. A review of curriculum materials related to each of the occupational areas under consideration.

2. A screen of the U.S. Department of Labor's Dictionary of Occupational Titles (DOT) to identify the job titles satisfying the parameters of the rationale for the specific cluster area.

3. A screen of the United States Office of Education (USOE) publication Vocational Education and Occupations to identify additional job titles.

4. A review of the resulting occupational job titles by appropriate program specialists at the Oregon Department of Education, Career and Vocational Education Section.

5. A review of these same job titles by an ad hoc manpower review committee composed of members from business, industry, labor, management, and government who represented the specific selection of occupations. (This group was responsible for reviewing the completeness of the occupations to be included in the cluster area, whether or not they had been classified into the correct USOE instructional program area within the specific cluster, and recommending the key occupations that would be used to develop the revised curriculum materials for the cluster.)

REVIEW OF CURRICULUM MATERIALS

The first step in the process to identify occupations to be included in the cluster was to review curriculum materials that might suggest the types of occupations that should be included. The primary source reviewed in the manpower analysis was the existing curriculum guide for the career cluster. For example, when developing the manpower summary for the accounting cluster of occupations the Oregon Department of Education publication Curriculum Guide for Accounting Occupations was reviewed. This approach helped to identify the key occupations presently recognized by the Department.

Other related curriculum materials included appropriate texts, special reports, monographs, and similar items.

DICTIONARY OF OCCUPATIONAL TITLES (DOT)

The U.S. Department of Labor's third edition of the Dictionary of Occupational Titles (DOT) was the next source reviewed to identify the occupations relating to a specific cluster area. This source was one of the two main classifying systems used within the individual career clusters. (The other being the U.S. Office of Education instructional program grouping of related occupations.) The DOT includes some 20,000 occupational job titles, each with a specific definition of that job title. Of these, Oregon identified approximately 4,300 occupations in its statewide employer skill survey conducted in 1969, and of these, 2,793 were included in the 18 cluster areas finally completed by the project's end. Each of the 20,000 occupations has a unique nine-digit DOT code, e.g., 860.381.026 (Carpenter), and can be interpreted as follows:

1. The first three digits identify any of 603 occupational groups. For example: 860 is Carpentry and Related Work. (Definitions of these groups can be found in alphabetical order in Volume I of the Dictionary of Occupational Titles. Volume II lists these groups in numerical order, as well as provides worker-trait groups.)

2. The second three digits, 381, identify the types of relationships with data, people, and things required by the job. The code for each digit has a specific meaning; numbers do not represent ranking order. (The codes and their meanings are explained in Volume II of the Dictionary of Occupational Titles.)

   These three digits are currently grouped to describe 114 specific worker-trait groups dealing with the data, people, things concept.

3. The last three digits, 026, are a sequential code which allows the DOT titles to fall into alphabetical order among other titles with the same first six DOT digits.

UNITED STATES OFFICE OF EDUCATION (USOE) CODES

The USOE publication Vocational Education and Occupations was the next source studied to locate additional job titles that could be included within a specific cluster. In addition to supplying additional job titles the publication provided the means to group all the DOT job titles identified. By specific instructional program area, each group includes those occupations having a high degree of commonality for purposes of instructional program planning and curriculum development. And unlike clusters which accommodate program planning and curriculum development at the secondary level, these program groupings within each cluster relate to more specific occupational instructional programs offered at the community college. The purpose of these groupings is to enable community colleges to focus on any one of the approximate 1 to 20 USOE program areas found within a specific cluster. High schools also focus on these groups, but in a more general way since they are working to develop broad entry-level competencies of all the USOE groups within the cluster.

TABLE I on the next page illustrates selected DOT job titles from the accounting cluster and how they are grouped according to USOE program area. Community colleges can develop in greater depth a very complete curriculum around one of the USOE groups, say USOE 14010100, Accountants. High schools would look to all three USOE groups, i.e., Accountants, Bookkeepers, and Cashiers[2], and prepare a more general curriculum from the key occupations (those preceded by an asterisk) found within each of the three USOE groups. The deeper analysis of a particular USOE grouping done by the community college curriculum planner provides not only entry-level skills, but skills somewhat beyond to allow the person to move more quickly into the more technical aspects of the USOE program area for which he is being trained.

PROGRAM SPECIALIST REVIEW OF THE MANPOWER INFORMATION

Once the occupational job titles have been identified and tentatively grouped by USOE program area, the vocational program specialist for the particular cluster area is asked to review them before they are reviewed by the ad hoc manpower review committee. The purpose of the specialist's review is to determine the completeness of the occupations, whether or not some of the occupations should be deleted or others added; insure that the occupations as revised have been grouped under the most appropriate USOE program area; and finally make initial recommendations about the key occupations that should be selected for task analyses.

When selecting the key occupations for the cluster, the program specialist is asked to consider the following guidelines:

---

[2] Cashiers as illustrated are workers handling cash and accounting for cash in bookkeeping operations. They are not cashiers using cash registers.

TABLE I

SAMPLE PAGE OF DETAILED OCCUPATIONAL LISTINGS IN MANPOWER SUMMARY OF ACCOUNTING OCCUPATIONS

V. Reported Employment in Office Occupations

USOE GROUP	DOT NO	DOT JOB TITLES	1967	EMPLOYMENT 1971	1975	EXP & REPL 1969-75
		ACCOUNTING/BOOKKEEPING				
14010100		Accountants		7226		2193
	188168098	Revenue Agent	551	623	595	0
	160168010	Auditor, County or City	9	6	7	2
	160188014	Accountant, Budget	21	26	27	4
	160188026	Accountant, Property	10	21	23	4
	160288010	Credit Analyst, Chief	14	7	11	5
	160188042	Auditor, Internal	28	44	49	10
	186118010	Business Mgr., College	29	41	48	17
	160188018	Accountant, Cost	133	152	159	23
	160188030	Accountant, Systems	58	53	64	24
	160188022	Accountant, Mach Proc	21	39	55	25
	161188014	Valuation Engineer	73	113	131	37
	188118074	Manager, City	189	156	170	43
	*186118014	Controller	345	379	416	77
	*161118018	Treasurer	705	905	879	110
	160188034	Accountant, Tax	148	188	257	118
	*160288018	Estimator	717	891	922	189
	*160188038	Auditor	804	752	828	231
	*160188010	Accountant**	2392	2830	3450	1274
14010200		Bookkeepers		10997		3124
	210368010	Acct Information Clk	0	1	1	0
	210388038	Distrib Acctng Clerk	5	5	5	0
	210388046	General-Ledger Bkpr	0	1	1	0
	210388018	Billing Control Clk	0	2	3	1
	210388054	Mortg-Loan-Comp Clk	14	19	19	5
	210388062	Reconcilement Clerk	13	16	17	5
	210388058	Night Auditor	12	16	19	6
	210588010	Insurance Clerk	18	37	43	10
	210388014	Audit Clerk	120	139	157	51
	210388010	Acct Classif Clk	103	140	152	76
	*210388026	Bookkeeper**	735	628	701	264
	*210388022	Bookkeeper**	7513	9993	11115	2706
14010300		Cashiers		1548		406
	211138014	Supervisor, Cashiers	3	2	2	0
	211468058	Teller	0	2	2	0
	211468018	Cashier, Currency Exchg	0	7	8	1
	*211368010	Cashier	1408	1537	1752	405

1. The occupation should have at least 250 or more employed in 1975.
2. The occupation should have at least 100 or more workers needed in the six-year period, 1969-75.
3. The occupation should have definite training possibilities.
4. The occupation should usually be the most representative of the other occupations included within the USOE group.

A key occupation does not have to be selected for each of the some 1 to 20 USOE program groups that might exist in any one cluster, although it is quite possible to do so if an occupation meets each of the four criteria.

ROLE OF THE OREGON EMPLOYMENT DIVISION

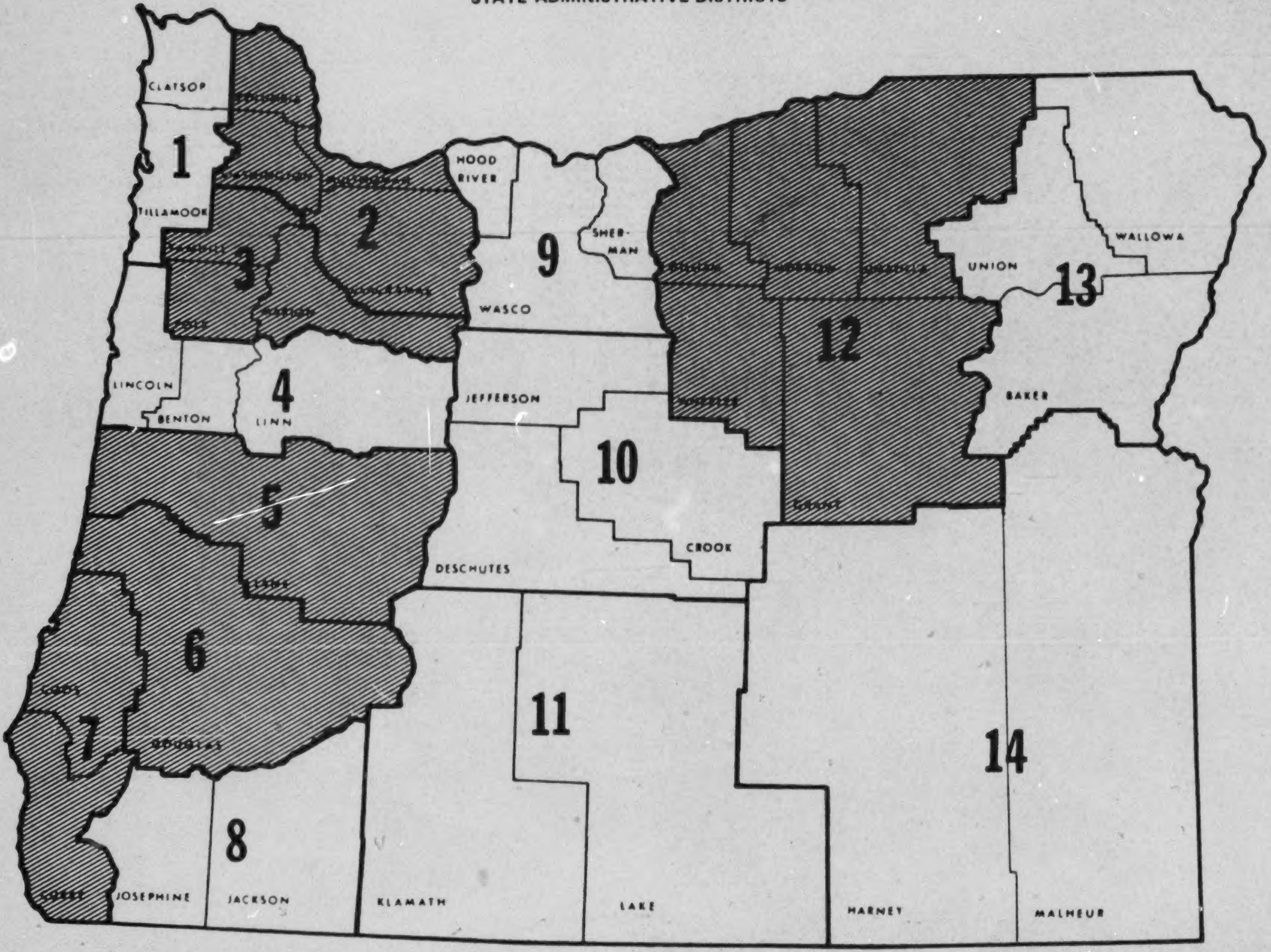
After the vocational program specialist has reviewed the manpower data and made his recommendation for key occupations, the estimates for employment and projected need are added. The primary source of the employment data is the Oregon Employment Division, Research and Statistics Section. (Other sources include census data, special studies, licensing agencies, and professional organizations.) This data is gathered by the section from its statewide survey of all employers in Oregon having wage and salary workers covered by unemployment insurance. The section also surveys the noncovered industries. These include churches, charitable organizations, and railroads. Estimates for self-employed, unpaid family members, and on-farm workers in agricultrue are not included.

The employment data presently used in Oregon to provide a comprehensive manpower data base for the 18 career clusters was compiled in 1969 by employer skill surveys.[3] From the results of these surveys, employment and projected need estimates were made for the state and selected local administrative planning districts 2, 3, 5, 6, 7, and 12 shown in Figure 1 on the next page.

---

[3] Employer skill surveys use unstructured questionnaires which require the employer to (1) identify the job titles of his employees, and (2) estimate his future need for these occupations, usually in the next one and five-year period. And although the employer estimates of projected need were not used (these were developed using the Bureau of Labor Statistics matrix codes), the job titles were used. This resulted in identifying job titles that have varying degrees of reliability, thereby creating some problems for effective program planning.

Figure 1
STATE ADMINISTRATIVE DISTRICTS


CLATSOP
COLUMBIA
1
TILLAMOOK
WASHINGTON
MULTNOMAH
2
YAMHILL
3
CLACKAMAS
MARION
POLK
HOOD RIVER
9
SHERMAN
WASCO
GILLIAM
MORROW
UMATILLA
UNION
WALLOWA
13
12
BAKER
LINCOLN
BENTON
4
LINN
JEFFERSON
WHEELER
10
CROOK
GRANT
5
LANE
DESCHUTES
6
COOS
7
DOUGLAS
11
14
8
CURRY
JOSEPHINE
JACKSON
KLAMATH
LAKE
HARNEY
MALHEUR

COMMITTEE REVIEW OF MANPOWER DATA

The final step in the development of the occupations used in the specific cluster was a thorough review of the detailed occupations, the USOE program groups to which they had been assigned, and the identification of the key occupations within the cluster by an ad hoc manpower data review committee. This committee was composed of members who had a working knowledge of the major occupational areas identified in the detailed listing of occupations for that specific cluster. Members were selected from business, industry, labor, management and government.

MANPOWER SUMMARIES

As each cluster of detailed occupations and related statewide manpower estimates, along with the ad hoc manpower review committee's recommendations for key occupations were completed, the results were immediately published under a separate cover for each cluster. (A list of these manpower summaries is included in Appendix G). Local administrative district employment estimates were not included. Neither were statewide supply estimates. All of the data, however, was made available from the Career Program Planning System (CPPS), a computerized manpower retrieval system, described in the following pages.

SOURCES AND TYPES OF MANPOWER SUPPLY

Once occupational employment needs are identified they need to be compared to the availability of trained people able to fill these needs. In Oregon, manpower supply data, training institute output, is obtained from the various agencies providing career and vocational training within the state.

Completion figures of these graduates at the secondary and community college levels are collected by the Career and Vocational Education Section of the Oregon Department of Education. These figures are then modified by the results of the statewide high school and community college student follow-up studies done annually. Students indicating they are "Available for Placement" are added to the supply component.

Completion figures of four-year colleges and universities (public and private) and proprietary schools are collected by the Oregon Educational Coordinating Commission, an agency created in 1975 by the Oregon Legislature, and whose members are appointed by the Governor. Since student follow-up studies of these graduates are not conducted, only the completion figures are used in the supply component of the manpower system.

The Oregon Bureau of Labor, Apprenticeship and Training Division, compiles the training output from the various apprenticeship training programs existing within the state. Student follow-up studies are not conducted by the division in Oregon; therefore, only the completion figures are used in the supply component.

Because apprentices are usually working while in training they are already included in the employment and projected need estimates. Care must be used by the program planner, therefore, not to train for more apprenticeable occupations than is necessary. For example, if a projected need is forecast for 15 additional carpenters, the program planner needs to be aware that the 15 carpenters presently in apprenticeship training are probably reflected in the need forecast. However, if it can be determined that some or all of the 15 carpenters are not employed at the time of the employer survey, then it can be assumed they are not included in the estimate of need and can likely fill the projected positions.

Future plans of the Oregon Department of Education are to work on a cooperative project with the Oregon Employment Division to develop an occupational employment supply model that will improve upon the present method of identifying the availability of vocationally trained individuals. In addition to those sources of supply already mentioned, plans are being considered to review the feasibility of including those individuals trained on the job by public and private employers, those individuals unemployed and presently registered with the local state employment offices, and military returnees who bring trained skills back to Oregon.

CAREER PROGRAM PLANNING SYSTEM (CPPS)

In order to store and easily retrieve for dissemination all of the foregoing information the Career Program Planning System (CPPS) was developed. This is a computerized system that provides four primary types of information.

These include the past, current, and future statewide employment estimates, along with projected five-year need for each occupation identified in Oregon; selected, heavily populated local administrative planning districts' employment and projected need estimates (Review Figure 1); statewide supply, including output from high schools, community colleges, apprenticeship training, proprietary schools, and four-year colleges and universities; and five distinct and separate ways by which occupational data can be requested. This occupational data can be requested for any or all of the 18 career cluster areas; by one or more USOE program groups within a cluster; by individual Dictionary of Occupational Titles number; by DOT job title; or by worker-trait group page number found in Volume II of the Dictionary of Occupational Titles. When requesting occupational information on a specific worker-trait group the user will receive a list of occupations requiring identical worker-trait group characteristics across all clusters, in addition to the statewide employemnt estimates. Local employment estimates are not available when occupations are requested by worker-trait group.

Program and curriculum planners needing occupational information are encouraged to contact the manpower analyst at the Career and Vocational Education Section of the Department of Education who will then complete a User Request Sheet. (See Figure 2 for sample copy.) The information requested is then coded and teletyped direct to the computer facilities located at Oregon State University in Corvallis. The information requested can be returned immediately by teletype or printed at the OSU Computer Center, and mailed back to the Career and Vocational Education Section within 24 to 48 hours. The data is then reviewed by the manpower analyst and forwarded to the planner requesting the information. (A sample of the output generated from the request is shown in Figure 3.)

The output sheets allow the user to compare the statewide demand with the statewide supply estimates by type of training institute. For example, USOE 17010100, COOLING, in Figure 3 lists six occupations having similar competencies. The user will note the total estimated employment and projected need for one or all of the occupations and then be able to compare the projected need for the USOE group, 173 for a six-year period (or approximately 29 for one year), to the total training output of 67 for the last school or college year. By examining the output sheet further, the user will note that no students had completed training in COOLING at the community college or apprenticeship levels.

Figure 4 illustrates the format of the data for a selected local administrative planning district. In this case, the user wanted local employment estimates and projected need for District 2 which includes the Portland metropolitan area. Data of this type can then be used at the local level for more precise program planning. Supply estimates are not available for comparison at the district level.

CAREER PROGRAM PLANNING (CPPS) SYSTEM

User Request Sheet

Figure 2

A. USER IDENTIFICATION

Name, Title & Address *Community College Vocational Dean, Portland Area*

Date Requested *June 4* Date Required *June 10, 1974*

User Classification

____ (1) State administration
____ (2) Local administrator (Central Office)
X (3) Local Administrator (Institution)
____ (4) Vocational teacher
____ (5) Nonvocational teacher
____ (6) Counselor
____ (7) Student
____ (8) Other, specify ____

B. TYPE OF REQUEST

Purpose

____ (1) Dist. Prog. Planning
X (2) Institution Program Planning
____ (3) Counseling
____ (4) Other, specify ____

Level

____ (1) Awareness (K-6)
____ (2) Exploratory (7-10)
____ (3) Preparation (11-12)
X (4) Specialization

Comments *Wish to determine need for implementation of new vocational program.*

C. DATA SEARCH PARAMETERS

1. State Manpower Demand Data

a) Is state manpower demand data required - NO ____ YES X

b) What types of data are required -
X past employment
X current employment
X future employment
X future occupational expansion + replacement needs

c) Do you wish to specify a minimum size of the six-year expansion and replacement need for the search - NO X YES, specify minimum ____

A , A , A , A
For Office Use Only

2. Local Manpower Demand Data

a) Is local manpower demand data requested - NO ____ YES, specify administrative district #'s 2

b) Do you wish to specify a minimum size of the six year expansion and replacement need for the search - NO X YES, specify minimum ____

____ : ____ , ____ : ____ , ____ : ____ ,
For Office Use Only

CPPS USER REQUEST SHEET
(Figure 2 continued)

3. State Manpower Supply Data

a) Is manpower supply data required - NO _____ YES __X__

b) What types of supply data do you want -

_____ High School (HS)
__X__ Community College (CCOL)
__X__ Apprenticeship (APPR)
__X__ Private School (PRIV)
_____ University (UNIV)

COOL, APPR, PRIV, _____, _____,

For Office Use Only

4. Occupations

Check the methods by which you wish to search for occupations and the specific type within the methods selected

a) _____ Cluster Group

_____ (1) Agriculture
_____ (2) Marketing
_____ (3) Health
_____ (4) Food Service
_____ (5) Accounting
_____ (6) Clerical
_____ (7) Secretarial
_____ (8) Mechanics
_____ (9) Construction
_____ (10) Elec/Electronics
_____ (11) Metals
_____ (12) Child Care
_____ (13) Clothing
_____ (14) Home Mngmnt
_____ (15) Drafting
_____ (16) Graphic
_____ (17) Service
_____ (18) Forestry

b) _____ Worker-trait Group
(see DOT for clarification)

c) __X__ U.S.O.E. Code

17010000 (air conditioner)
17010100 (cooling)

d) _____ D.O.T. Number

e) _____ Job Titles - _____

CLUSTER _____, _____, _____, _____,
WTG _____, _____, _____, _____,
USOE 17010000, 17010100, _____, _____,
DOT _____, _____, _____, _____,
ALPHA _____, _____, _____, _____,
For Office Use Only

Figure 3
CPPS REQUEST OUTPUT

```
KEY:  Line 1: A,A,A,A
      LINE 2: 2
      LINE 3: CCOL, APPR, PRIV
      LINE 4: USOE, 17010000, 17010100
                                                                     DEMAND                    SUPPLY
                                                                      STATE          TRAINING INSTITUTIONS
CLUSTER
 CODE       USOE       DOT-CODE                                             6-YR
PR SC WTG   CODE        NUMBER     DOT JOB TITLE        PAST    CURR   FUT.  DEM.   COOL          APPR    PRIV

      08   17010000  AIR CONDITIONING
08 00 312  17010000  637281010  AIR-CONDI COMM            2       2     2      1
08 00 312  17010000  620281010  AIR-CONDI MECH            1      12    13      2
08 00 299  17010000  950132010  REFRIG ENGINEER HEAD     11      10    12      4
08 00 435  17010000  950782046  REFRIG ENGINEER          90     172   194     66

         TOTALS USOE 17010000
                                                        104     196   221     73     0            0      3
      08   17010100 COOLING
08 00 312  17010100  637381014  REFRIG UNIT REPAIR        0       3     4      0
08 00 380  17010100  637387014  REFRIG MECH HELPER       24       4     4      0
08 00 299  17010100  639131010  FOREMAN COOLER            4       1     1      0
08 00 322  17010100  827884010  AIR-CONDITIONING          5      13    20     12
08 00 312  17010100  637281034  REFRIG MECHANIC         159     190   238     13
08 00 312  17010100  827381022  REFRIG MECHANIC         150     330   372     88

       TOTALS USOE 17010100
                                                        342     541   639    173     0             0    67
      TOTALS CLUSTER CODE 08
                                                        446     737   860    246     0             0    70
         REPORT   3 TOTALS
                                                        446     737   860    246     0             0    70
```

Figure 4

CPPS REQUEST OUTPUT

```
KEY:  Line 1: A,A,A,A
      Line 2: 2
      Line 3: CCOL, APPR, PRIV
      Line 4: USOE, 17010000, 17010100
                                                              DEMAND
                                                   LOCAL ADMINISTRATIVE DISTRICTS
USOE                                   DIST 2
CODE        DOT JOB TITLE             CURR   E+R

      08  17010000 AIR CONDITIONING
17010000  AIR-CONDI COMM                 0     0
17010000  AIR-CONDI MECH                 1     0
17010000  REFRIG ENGINEER HEAD           0     0
17010000  REFRIG ENGINEER                4     1

     TOTALS USOE 17010000
                                         5     1
      08  17010100 COOLING
17010100  REFRIG UNIT REPAIR             0     0
17010100  REFRIG MECH HELPER             0     0
17010100  FOREMAN COOLER                 0     0
17010100  AIR-CONDITIONING               0     0
17010100  REFRIG MECHANIC              115    48
17010100  REFRIG MECHANIC              225    29

     TOTALS USOE 17010100
                                       340    77
     TOTALS CLUSTER CODE 08
                                       345    78
     REPORT  3 TOTALS
                                       345    78
```

MANPOWER ACTIVITIES PRIOR TO PROJECT FUNDING

The manpower activities described were commenced in the latter part of 19[illegible]1, some two-and-a-half years prior to the funding of the Statewide Manpower/Curriculum Management System Project in July 1974. Much of this time prior to 1974 was spent developing the techniques necessary to identify the occupations and how to design the computer system and programs for the Career Program Planning System. The additional time was spent completing the manpower analyses for the eight career clusters outlined in TABLE II, including the occupational information already described, and publishing a manpower summary for each cluster area as it was completed under a separate cover.

MANPOWER ACTIVITIES CONDUCTED DURING THE PROJECT

During the 18 months of the project the remaining 10 major occupational areas were completed. (See TABLE III.) All of the information developed was included in the Career Program Planning System, and the remaining manpower summaries needing to be completed were published with the exception of the one for the agricultural occupations.

The manpower summary for the agricultural occupations experienced a major delay because of several problems. One was the problem of deciding the nature of occupations having agricultural competencies. This problem stemmed from not being able to decide if agricultural competencies included those in agriculture-business, as well as those in the area of agriculture production, which included such sub-elements as agriculture production on-farm, animal science, and plant science. For example, the problem in on instance dealt with how to classify agricultural power and machinery occupations. These included occupations like tractor mechanic and farm equipment mechanic. To include them in the agricultural cluster area would seem to violate the competency-based cluster concept because these occupations were already included in the industrial mechanics cluster. Program specialists of both clusters each felt the group of occupations should be included in their cluster area.

Still another problem dealt with which DOT job titles should be classified under a given USOE group. This posed quite a problem because the USOE publication Vocational Education and Occupations, the source document used to classify DOT job titles by USOE program group, listed the agricultural power and machinery occupations in the agricultural cluster area. In Oregon these same occupations are included in the

TABLE II

MANPOWER ANALYSES COMPLETED PRIOR TO JULY 1, 1974

	OCCUP. PROFILE	STATE EMPLOYMENT	LOCAL EMPLOYMENT	STATE SUPPLY	IN CPPS	MANPOWER SUMMARY	COMPLETED
Agriculture							
Marketing	X	X	X	X	X	X	X
Health	X	X	X	X	X	X	X
Food Service							
Accounting							
Clerical							
Steno-Secretarial							
Industrial Mechanics	X	X	X	X	X	X	X
Construction							
Electricity-Electronics	X	X	X	X	X	X	X
Metals	X	X	X	X	X	X	X
Child Care							
Clothing							
Institutional/Home Management							
Drafting	X	X	X	X	X	X	X
Graphics	X	X	X	X	X	X	X
Service	X	X	X	X	X	X	X
Forest Products							

TABLE III

MANPOWER ANALYSES COMPLETED DURING PROJECT JULY 1, 1974 to DECEMBER 31, 1975

CLUSTER AREA	OCCUP. PROFILE	STATE EMPLOYMENT	LOCAL EMPLOYMENT	STATE SUPPLY	IN CPPS	MANPOWER SUMMARY	COMPLETED
Agriculture	D	D	D	D	D	A	A
Marketing	B	B	B	B	B	B	B
Health	B	B	B	B	B	B	B
Food Service	D	D	D	D	D	D	D
Accounting	D	D	D	D	D	D	D
Clerical	D	D	D	D	D	D	D
Steno-Secretarial	D	D	D	D	D	D	D
Industrial Mechanics	B	B	B	B	B	B	B
Construction	D	D	D	D	D	D	D
Electricity-Electronics	B	B	B	B	B	B	B
Metals	B	B	B	B	B	B	B
Child Care	D	D	D	D	D	D	D
Clothing	D	D	D	D	D	D	D
Institutional/Home Management	D	D	D	D	D	D	D
Drafting	B	B	B	B	B	A	A
Graphics	B	B	B	B	B	B	B
Service	B	B	B	B	B	B	B
Forest Products	D	D	D	D	D	D	D

Key:
B--Completed before Project
D--Completed during Project
A--Completed after Project

industrial mechanics cluster area, and therefore additional time needs to be spent to resolve the differences of opinion between the program specialists and the members of the ad hoc manpower review committees for industrial mechanics and agricultural occupations. A related problem dealt with the identification of the key occupations to be included in the agriculture cluster area. Since the grouping of the occupations within a given USOE group, as well as the USOE groups still to be assigned to the agriculture cluster has not yet been decided, the selection of the key occupations can only be very tentative.

A final problem delaying the completion of the manpower summary for the agriculture occupations was the problem of determining the on-farm employment. Since on-farm workers and self-employed were not surveyed by the Oregon Employment Division, other sources had to be used to identify these workers. This was accomplished in two ways. One, a special survey was made by the Employment Division of all farmers applying for workers compensation insurance from the Oregon State Accident Insurance Fund (SAIF).[4] This survey asked the farmers to respond to the numbers of on-farm workers by occupational title preprinted on the survey questionnaire. And two, self-employed farmers were identified by referring to the 1969 Oregon Census of Agriculture. One self-employed farmer or rancher was counted for each type of farm or ranch identified, e.g., Farmer, Cash Grain. Since the type of farm or ranch was listed by gross sales volume this factor also was taken into account by counting only those farmers or ranchers who had gross sales over $5,000 for the year. Those under this minimum were excluded in order to eliminate those farms or ranches that tended to be "hobby" farms or ranches, and therefore did not represent firm self-employment opportunities for the entrepreneur.

EMPLOYER SURVEY PROGRAM TO BE REVISED

Recognizing the weakness of the employer skill surveys used to collect the employment estimates in 1969, Oregon in 1970 agreed to be one of nine states to participate with the U.S. Department of Labor in its first attempt to implement the new Federal-State Occupational Employment Statistics (OES) Program. The need for this cooperative system was generated by the increasing demand from economists, manpower analysts, and education planners for current and reliable data on a national, state, and local area basis. The OES program is designed to collect occupational employment statistics on a regular recurring basis that will provide reliable industry and occupational employment data.[5] As such, the occupational data supplied by this collection system will produce for Oregon and other participating states a comparable employment series by occupation that will provide a means for systematic manpower planning.

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[4] The farmers insuring their on-farm workers with SAIF did not represent 100 percent of the farmers in Oregon since farmers can insure for workmens compensation with any comparable insurer; however SAIF was known to be the insurer for the majority of Oregon farmers. Using SAIF as the basis for sampling also eliminated the possibility of surveying the same farmer twice.

DISSEMINATION OF MANPOWER INFORMATION

The manpower summaries for each cluster area were distributed as they were completed both before and during the project. Individuals and groups receiving them included local district career and vocational program planners, deans of occupational education at the community colleges, chairmen of the vocational divisions of these two-year colleges, each of the 16 career education regional coordinators in the state, occupational program and curriculum specialists at the Oregon Department of Education, Career and Vocational Education Section, manpower planners for the Comprehensive Employment and Training Act (CETA) prime sponsors, and members of the Oregon Council of Career and Vocational Administrators (OCCVA).

Intensive in-service workshops are planned for all secondary and community college districts and Comprehensive Employment and Training Act prime sponsors and their staffs during 1976 and 1977. These will be conducted, however, only after the OES program is fully implemented and the Career Program Planning System has been updated with the new OES job titles and employment estimates. This update will result in the CPPS and the second edition of the manpower summaries for each career cluster having significantly fewer occupational job titles. For instance, the CPPS presently lists 2,793 job titles. Once the update is implemented CPPS will have no more than some 1,500 job titles. In addition, the new titles will be identified as OES titles. In the past the titles have been DOT titles.

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[5] The OES program requires the use of a specially designed questionnaire for each industry surveyed. This questionnaire lists the choices of occupational titles to which the employer may respond, along with an accompanying job description. A special section is provided to identify new and emerging occupations.

Obviously this reduction of titles eliminates the degree of specificity previously available in each cluster area, but now provides much greater reliability for each title listed, and certainly much greater validity for the accompanying employment and need estimates. However, some problem still remains because of the broadness of the title. For example, the new OES title CASEWORKER will now include such DOT titles as medical social worker, psychiatric social worker, parole officer, group worker, et al. This has created some preliminary problems because two of the titles are in the health cluster and two of the occupations are in the service cluster. However, the problem does not seem insurmountable and is expected to be resolved, although not without some degree of difficulty. The purpose of the in-service activities when conducted will be to enhance the career and vocational program planning skills of the participants. Counselors from all educational levels, as well as CETA manpower planning staffs also will be invited to attend to enable them to become more aware of the occupations classified within a specific cluster area. An awareness of this type of information can then be used to counsel students into those educational programs where job opportunities exist, as well as those areas that are of interest to the students.

The information can also be used by the participants to help place students into those occupational areas where significant employment opportunities exist.

ONGOING EVALUATION AND REVIEW OF THE MANPOWER SYSTEM

Traditionally manpower demand and supply systems have been a one-time affair. Publications have been written once, and used for the next five years with little attention to the fact that the labor market may be experiencing trends in employment opportunities that necessitate possible changes in existing vocational program offerings. So that this will not happen in Oregon, the Career Program Planning System and related manpower summaries will be updated annually, along with new five-year employment and need projections from the year of the annual study.

Present plans are to reduce the numbers of local administrative planning districts being supplied manpower estimates from six to four. Districts 6, 7 and 12, representing Douglas County; Coos and Curry Counties; and Gilliam, Grant, Morrow, Wheeler and Umatilla Counties will no longer have employment estimates made for them. However, manpower estimates will now be gathered for District 8 which includes Josephine and Jackson counties. Districts 2, 3 and 5 will continue to have local employment estimates provided since they represent the three standard metropolitan statistical areas in the state.

Two other activities will be included in the ongoing review and evaluation process of the manpower system. These include a careful assessment of the detail of occupational job titles to insure that the new OES titles are not so broad that they are of little value for vocational program planning, and a refinement of the present method of estimating supply. Activities are already underway to insure improvements in these areas.

TASK ANALYSIS

Depending upon employment projections, priorities are identified in order to determine which areas need instructional materials based on task analyses.

Task analysis is the essential process upon which vocational curricula is developed. In essence, a task analysis is an inventory of every conceivable task that a worker in an occupation might perform. While it is possible, indeed probably that the student will neither be trained to nor actually perform all these tasks, it is essential to determine what they are so that legitimate decision can be taken about what should and should not be included at various instructional guide levels, whether they be used for secondary, community college, private schools or apprenticeship training. Each task in an Occupational Analysis is analyzed to determine whether it is an entry level task. Entry level refers to those abilities which the employee normally has when applying for the job. If it is not necessary to be able to perform this task to get the job, it would be marked "on-the'job", meaning the task can, or will be, learned after employment. Refer to Appendix A for a sample task analysis.

All task analyses in Oregon are screened by a committee of persons who are presently working in the respective occupation. This assures relevancy to the present-day "world of work". The task inventory in final form is the key hypotheses upon which a vocational program should be based, implemented, and tested. It is the basis upon which all competency-based instructional materials are developed in Oregon. Appendix C outlines the procedures used for conducting task analyses in Oregon.

WORK EXPERIENCE TRAINING PLANS

The writing, compilation, and field testing of these training plans and student progress records came about as a result of the expressed need of teachers, work experience coordinators, and members of the State Advisory Committee for Cooperative Work Experience.

Task analyses from the Ohio State University, University of Texas at Austin, University of Missouri, Iowa State University, University of Northern Iowa, Central Connecticut State College, and the Oregon State Department of Education has been utilized in the formulation of the training plans.

The coordinator (or teacher) may use these training plans and progress records to design individual study programs to match a planned cooperative work experience program. The coordinator, employer, and student may use the preprinted training plan as a check-off list of on-the-job learning activities coupled to desirable related information (studies) which may be learned "in school" or "on-the-job". The items checked as related information form the basis for the student's individualized instruction program.

> The pre-printed training plan should save time for the employer, coordinator, and student in deciding what the employer will undertake and what the student will do both on-the-job and in school.

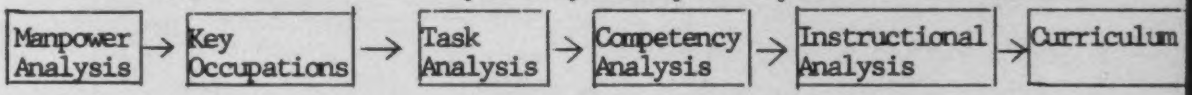
The training plan is also intended as a tool to be used in counseling the student before going out for an interview with the employer. An added advantage - the signed and completed training plan becomes a permanent record of the student's accomplishments and progress. Refer to Appendix G for a sample training plan.

COMPETENCY DERIVATION

The heart of the problem for this component of the system was to derive core competencies that are common to key occupations for an occupational cluster. In the context of this project, that problem is a matter of transforming information about each key occupation in the form of a task analysis into information which specifies what students must learn to be competitive for entry level jobs in the cluster area. This problem can be structured according to two major requirements:

- identify work performed at the entry level for key occupations
- identify work that is common to the set of occupations

Two major sets of factors bear on the problem and its resolution. First, because the problem occurs as part of a longer system of information flow, the competency analysis process must be compatible with information content and format as available for input, and with the content and procedural attributes of activities which will use competency analysis output. This relationship is depicted in the block diagram below, Competency Analysis System Environment.



Competency Analysis System

CURRICULUM DEVELOPMENT ENVIRONMENT

The main impact of this environment is its definition and structuring of input data. For example, the most significant factor affecting the content of input task analyses is the experience, ability, and thoroughness of whoever makes out the list of task statements, the task analyst, for each key occupation.

At this step, the preceding "task analyses" were already completed. Accordingly, major emphasis was given to development of a competency analyses process which would accept and use available data and would not require starting over on task analysis, at least for the pilot cluster, Electricity-Electronics. (Several major deficiencies in task analyses were noted and the task analyses process was modified based on those findings.)

It is particularly important to an understanding of the problem to realize the burden upon this total communication process (from the world of work to the aspiring student) brought about by the present limits of language and data handling.

These constitute the second set of factors bearing on the problem. At best, a task analysis is an outline of the work performed by a worker. Each task statement is a clue to the competency analyst as to required skills and knowledge. It is easy to state three or four sophisticated tasks for an occupation which imply a mastery of most of the skills and knowledge for the entire cluster. However, a set of such statements would be an ineffective message to the curriculum designer who must arrange a meeting between work requirements and student readiness. So task statements to be used for input to curriculum are spelled out in much greater detail. (See Appendix A, Sample Task Inventory)

This strategy is essentially one of allocating a greater number of symbols per unit of information. Rather than three or four global tasks, our task analyses consist of several hundred more detailed statements for each key occupation. But the actual flow of information desired takes place mostly by implication. That is, a reading of one task statement by the competency analyst implies skill and knowledge requirements by helping him to "target" or select from information already in his possess, and the notion that the symbols themselves "contain" information is not adequate.

A more effective concept is that of the fence post. Each word of a task statement acts as a flag for the analyst, helping him to construct a set of boundaries within his own domain of knowledge about work performed in the cluster area. Once those boundaries are established, providing a subdomain of work performed for the task at issue, the competency analyst then uses that subdomain as his guide while scanning the related domain of skills and knowledge, to construct a new set of boundaries which defines or identifies the particular skills and knowledge required for task performance.

Because this series of steps involves a great many semantic uncertainties and a complex of behavior sampling problems, the introduction of professional jargon and other additions to lay language usually is counter-productive. It is for these reasons that the competency analysis process developed as a part of this project operates almost enclusively with lay language.

This constitutes a departure from the usual practice of classifying tasks according to behavioral categories. Our early studies of the feasibility of this general strategy indicated that any set of categories simply cut off the flow of information desired.

For example, selecting a group of tasks under the heading "Decision-Making" focuses the competency analyst's attention upon that category of behavior for that group of tasks. This cuts off the desired flow of information in two ways. First, he tends to ignore other aspects of skill and knowledge required for that group of tasks. Second, he tends to ignore decision-making in his analysis of other task groups. Further, every task includes the behavior identified by almost all categories of behavior suggested by most sets of categories. This dilutes a relatively clean-appearing selection problem into much more uncertain processes of estimating degrees of importance of one category over others, or combining categories according to complex rules, or assigning weights for each category to all tasks.

Finally, the output of a classifying operation is a new language intermediate between that in which the tasks are stated and that used to specify skills and knowledge. That is the result is to inject an additional step between task statements and skill/knowledge specifications. Accordingly, the competency analysis process developed for this project stresses the facilitation of information flow from task statement to competency statement. The process produces a set of competency statements and each answers the question, "Skill and Knowledge about What?" The statements are supplemented with additional information which specifies characteristics and conditions of the work situations identified, which are common to the key occupations of the cluster area. The goal for the competency analysis portion of the Project was to develop a process whereby core competencies for each occupational cluster area could be derived.

These were termed "common competencies" and would be suitable in format and content for subsequent instructional analysis. Both of these activities were to be carried out by a central staff of State specialists and consultants and the information produced would then be distributed around the State as the nucleus for more localized curriculum development.

Several activities were defined to structure the development activity.

Activity 1. Review methods which might be applicable to the problem, and select or design a method meeting local needs.

Activity 2. Review development results already produced to inform the selection and design activity identified under Objective 1.

Activity 3. Determine specific criteria to be met by the process under development.

Activity 4. Emphasize as a requirement on the process, that it be replicable. That is, produce a process which will yield the same common competencies in successive operations upon the same input data.

Activity 5. Use electronic data processing as much as possible to handle the logistical burden of working with thousands of pieces of information.

Activity 6. Develop a process which can accept and use available task analyses with a minimum of re-work.

STEPS TOWARD COMPETENCY ANALYSIS

In accordance with the nature of the problem and objectives as noted in previous sections of this report, development of the competency analysis process proceeded in the sequence shown in the following block diagrams. A short discussion of activity as indicated by each segment of the diagram follows.

I	II	III	IV
Determine basis for grouping similar tasks	Design an information handling procedure to detect and group similar tasks	Develop Computer Processes required to implement the procedure	Develop manual procedures to use Machine-generated information

In these discussions, the term "common" is used to refer to the occurrence of tasks or task characteristics in more than one of the key occupations for the cluster; i.e., a "common" task or task characteristic is one which occurs in two or more key occupations. The term "similar" refers to tasks which are identical or alike in one or more ways.

I. Determine Basis for Grouping Similar Tasks

Three methods were explored. First, an attempt was made to process task statement text with the KWIK Index computer program. Second, task classification was tried using several versions of a list of work processes. Details of these two approaches were included in Application for Federal Assistance. Neither approach produced results which could be easily interpreted by staff or consultants regularly available, and the methods required to generate the content and format of information suitable for Instructional Analysis and administrative uses were judged to be not replicable.

Groups of tasks produced by the KWIK Index required too great a dependence upon subjective work by the competency analyst. Classification of tasks required too great a dependence upon subjective work by the task analyst.

In the course of testing and attempting to refine these approaches, the problem became somewhat better understood. Accordingly a third approach was developed which, while not rigorous, groups task statements by a replicable method, is flexible enough to be applied to all clusters and used by available staff, and is sufficiently sound to be adapted and improved as needed. Several constraints and problems noted in testing the KWIK index and "work-processes" became guidelines to the design of our new approach. Chiefly, we noted the following:

a. An inability by staff members to agree upon kinds or types of tasks. Neither method offered a reliable task coding scheme nor did either present a convenient way to account for response set and lack of intervoter reliability.

b. A limit of from 40 to 60 task statements on the ability of staff to scan and report. Faced with several thousand of these terse statements, the competency analyst would instinctively try to group them, but his criteria for grouping them would change during the work.

c. A deficiency in understanding of the objective of competency analysis. It became increasingly difficult to prepare adequate instructions for test personnel, when an example of a "common competency" could not be produced.

d. A misinterpretation of the readiness of curriculum specialists to "let the computer" make decisions. Educators are wary of dehumanization in their work.

These observations helped to establish a need for a procedure that would permit step-by-step visibility to the analyst, of each phase in the process for deriving statements of competency and would permit a careful review of similarities and differences across the input of different people. Major emphasis was given to organizing subsets of task statements to facilitate scanning, and to provide a preliminary or pre-analysis of competencies.

It was also noted that agreement among analysts increased as the focus of attention was moved away from abstractions about worker behavior, and toward more concrete task characteristics, and that was much easier to agree on the answer to questions about tasks than it was to supply task characteristics without the guidance of a question to which to respond.

An informal task model, covering input, action, and output was drawn up and a preliminary set of questions about each of the three task phases was written. Based on a subset of 16 of these questions, a small selection (88) of task statements were grouped according to strings of questions answers as a rough feasibility demonstration. Review of results indicated that task statements could be grouped in this way so that known similarities among them are directly indicated without cutting off the flow of information mentioned in discussion of the problem above.

Some general estimates of the differentiary power of the set of 16 questions indicated that unless these questions and response options were answered with complete consistency, groups of task statements far too lengthy for scanning might be produced from input consisting of over a thousand statements. While response consistency was greatly improved over our experience with classifying tasks, there was little in the results to indicate that it could be considered as utterly reliable. Therefore, the number of questions was virtually doubled for the full demonstration test. The test instrument is attached as Appendix B.

The set of blanks at the top of the page are filled in by the respondent. A simple recording sheet (not shown) is used by the respondent and record his responses in a form that is convenient for keypunch. It is very rough and our experience with it suggest several modifications. All of the questions offer either high-contrast response options, or general estimates as options. These features reduce the chances of disagreement among respondents, and also greatly accelerate the answering or "coding" process. Respondents with about two hours of experience,plus some initial orientation, usually average from three to five minutes per task statement.

It must be noted that all the questions are relatively indirect as regards workers behavior or skill and knowledge. The effect of the questions is to establish a fairly reliable basis for grouping tasks that are "similar" because responses to the questions are identical or similar for some subset of the total population of task statements for the cluster area. However, no information implied by the task statements is "lost" through classification. The competency analyst is presented with a group of statements in the original test as well as with a profile of task situation characteristics accompanying each statement. He can see at a glance the basis upon which these statements are grouped, and where all the profiles (or patterns) of responses are not identical, the differentiating characteristics stand out clearly. Finally, because responses are coded numerically, a body of data amendable to machine processing is generated.

II. Design an information handling procedure to detect similar tasks.

III. Develop matching processes required to implement the procedure.

These two phases of development are treated together because work proceeded in both simultaneously.

First, a listing was produced of all tasks with identical patterns of responses. This made use of about a third of the total of 1140 task statements, and produced 142 groups of tasks. No group included tasks from more than one occupation excepting a high frequency of tasks for Radio Repair and TV Repair. At first, this result was discouraging because it was attributed to dominant response set effected while carrying out the tedious work of coding answers to the questionnaire.

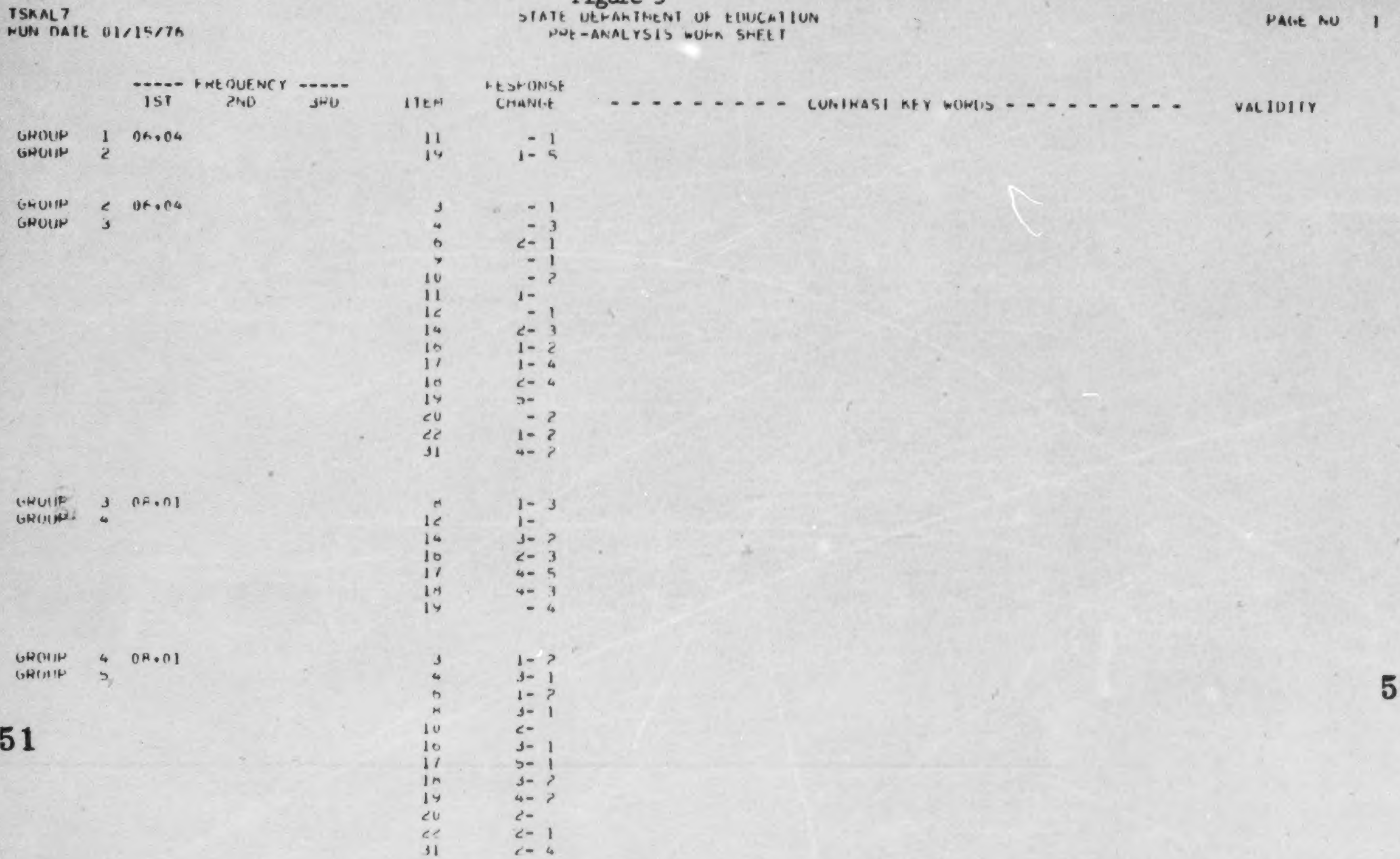
A spot check item analysis was worked out whereby the differences between groups are used to assess the consistency with which responses have been coded. The worksheet for this step is attached as Figure 5. The section of data at the left identifies task groups being compared (in reference to the groups of duplicate tasks mentioned earlier). The column labelled "Frequency" gives the number of times this occupation and block occurred in the specified task group. The column labelled "item" refers to the questionnaire identifying the specific question which has indicated a difference between the two groups of tasks. The next column further amplifies the nature of that difference by displaying the specific response change between the two groups. In using the worksheet the analyst writes in one or two words drawn from the respective task statements which most clearly specify the nature of each of the differing tasks. He is then able to review the response changes across a variety of task groups and determine the validity of response selection. His results are used to eliminate inconsistently answered questions, and "collapse" ambiguous response options.

The spot check indicated that the response set was strong, but only as it turned up in the original task statement writing. For example, the Radio Repair statements were apparently reviewed by the State's consultant who write the task inventory for TV Repair. This finding led to further discoveries of response set within each occupation and subsequent review of the consistency of responses has largely shown that tasks which elicit patterns of nine responses or more which are identical are indeed quite similar tasks. The worksheet was incorporated as a part of the procedure because of its convenience as a pre-analysis of grouping patterns. Using the worksheet, a relatively naive analyst can precisely locate two troublesome sources of problems in the coded data:

> First, it is easy to detect questions which carry little information. They are answered with the same response for almost all tasks. For example, in the test cluster of Electricity-Electronics the worker has electrical energy available for use in virtually all tasks.
>
> Second, it is also easy to detect inconsistently used response options. Often it is quite clear that the reason lies in poor wording of the question or responses, or in some other aspect of the coding work.

Results of the pre-analysis are used to override deficient data in subsequent processing. Two override capabilities are used. First, questions can be ignored entirely by the machine. Second, responses can be combined in such a way as to retain valid data and ignore the invalid. For example, if responses 2 and 3 to a question are used indisriminately, they can be "collapsed" so that the question subsequently appears (to the machine) to offer

Figure 5



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TSKAL7                                           STATE DEPARTMENT OF EDUCATION                                          PAGE NO    1
RUN DATE 01/15/76                                  PRE-ANALYSIS WORK SHEET

                ----- FREQUENCY -----                      RESPONSE
                 1ST      2ND      3RD        ITEM          CHANGE      - - - - - - - - - CONTRAST KEY WORDS - - - - - - - - -      VALIDITY

 GROUP    1   06.04                             11              - 1
 GROUP    2                                     19            1- 5

 GROUP    2   06.04                              3              - 1
 GROUP    3                                      4              - 3
                                                 6            2- 1
                                                 9              - 1
                                                10              - 2
                                                11            1-
                                                12              - 1
                                                14            2- 3
                                                16            1- 2
                                                17            1- 4
                                                18            2- 4
                                                19            5-
                                                20              - 2
                                                22            1- 2
                                                31            4- 2

 GROUP    3   08.01                              8            1- 3
 GROUP    4                                     12            1-
                                                14            3- 2
                                                16            2- 3
                                                17            4- 5
                                                18            4- 3
                                                19              - 4

 GROUP    4   08.01                              3            1- 2
 GROUP    5                                      4            3- 1
                                                 6            1- 2
                                                 8            3- 1
                                                10            2-
                                                16            3- 1
                                                17            5- 1
                                                18            3- 2
                                                19            4- 2
                                                20            2-
                                                22            2- 1
                                                31            2- 4
```

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these responses, (0,1, and 2/3(rather than the four originally offered (0,1,2,3). A response frequency table (attached as figure 6) is very helpful in this spot check or preanalysis. On the sample figure response number referring to the questionnaire is printed across the top and question number at the left side. Note that a "zero response" is significant. The numbers printed under each response number give the frequency of that response for the question indicated at the left. Note also that this number is also a statistic which implies response commonality for the cluster.

A second attempt to produce preliminary groups of tasks was derived from the frequency table. The questions were sequenced according to response frequency. The question having the response with the highest frequency put first, the question having the response with next highest frequency was put second, and so on until all questions had been accounted for by this process.

Next, a simple formula was developed to describe the density of identical task-situation characteristics for each of the "frequency-based" groups. Parameters are:

- number of tasks for which a response is identical
- number of tasks in the group
- number of questions with identical responses.

These three parameters were varied to establish the following criteria of similarity:

1. Responses must be identical for at least 10 per cent of the tasks in the group.
2. The group must consist of between 20 and 95 tasks.
3. With criterion 1 accounted for, at least nine characteristics must be identical.

Any set of 12 (or more) responses meeting these criteria is then taken as a Master Pattern, and used to retrieve tasks having a minimum of nine identical

Figure 6

```
TSKAL1                                        STATE DEPARTMENT OF EDUCATION
RUN DATE 01/19/76                                RESPONSE BY QUESTION
                                             CLUSTER 10  OCCUPATION      DUTY

       NO
QUST ANSWER ---1-- ---2-- ---3-- ---4-- ---5-- ---6-- ---7-- ---8-- ---9-- --10-- --11-- --12-- --13-- --14-- --15-- --16-- --17--
   2           280                   22           114     61    331     23      7     20
   3   39      819
   4   39      533     49    237
   5             1      6    851
   6           125    209    526
   7   37      815      4      2
   8  335      390           133
   9  102       71    665
  10  626                    232
  11  808       50
  12  553      305
  13  472      322      9     24     39      1
  14    1        2           856             5
  15    1      109    748
  16           765            93
  17    5      699     33           114             2
  18  204       53    601
  19  100       38    560           160
  20  838       20
  21  200             237    421
  22    2      423    425      5      5
  23   11      769     49     24
  24    7      615    219     14      3
  25  747       46     10      5
  26  652       12    150            44
  27  651      207
  28  651      207
  29    6      850      2
  30   79      773      6
  31    3                    251    604
```

responses, from the total file. In most cases, these sets of tasks bridge several occupations. These sets of tasks along with the task-situation characteristics, abbreviated to one or two words, are printed out for review of the competency analyst and for his use in writing statements of competency.

In addition , a modified set of criteria are used to elicit Master Patterns from the smaller groups of tasks as organized in the preliminary groupings. Groups as small as five tasks are considered. This secondary set of Master Patterns is then used to retrieve similar tasks and this process usually produces task groups which do not bridge several occupations. Commonality is attained by associating each secondary group with one or more primary groups which has the effect of amplifying the more general competencies based in the primary groups.

As might be expected, the procedure as described above does not account for all tasks in the file. Some tasks are not duplicated and so do not occur in the preliminary groupings. Retrieval based on primary and secondary Master Patterns picks up a substantial number of these because complete duplication of task-situation characteristics is not a requirement at this later state of the procedure. However, there may always be a residual of task statements which should not be allocated to groups by machine. Two final steps are therefore, added to the procedure to insure that skills and knowledge requirements implied by this residual of tasks will be considered in formulating the statements of common competency.

First, the competency analyst reviews the residual statements and subjectively allocates each to one or more of the machine derived task groups.

Second, a commonality report for each response is printed from the machine-readable file. A sample report is attached as Figure 7. On the sample, the left-most column presents question number (referring again to the questionnaire), the next column presents response option number (blank=no response) and the third column presents the frequency (referring to the frequency distribution). Thus, response 3 to question 5 was the most frequently used of all the responses. This report presents data which is representative of every task in the file.

Figure 7

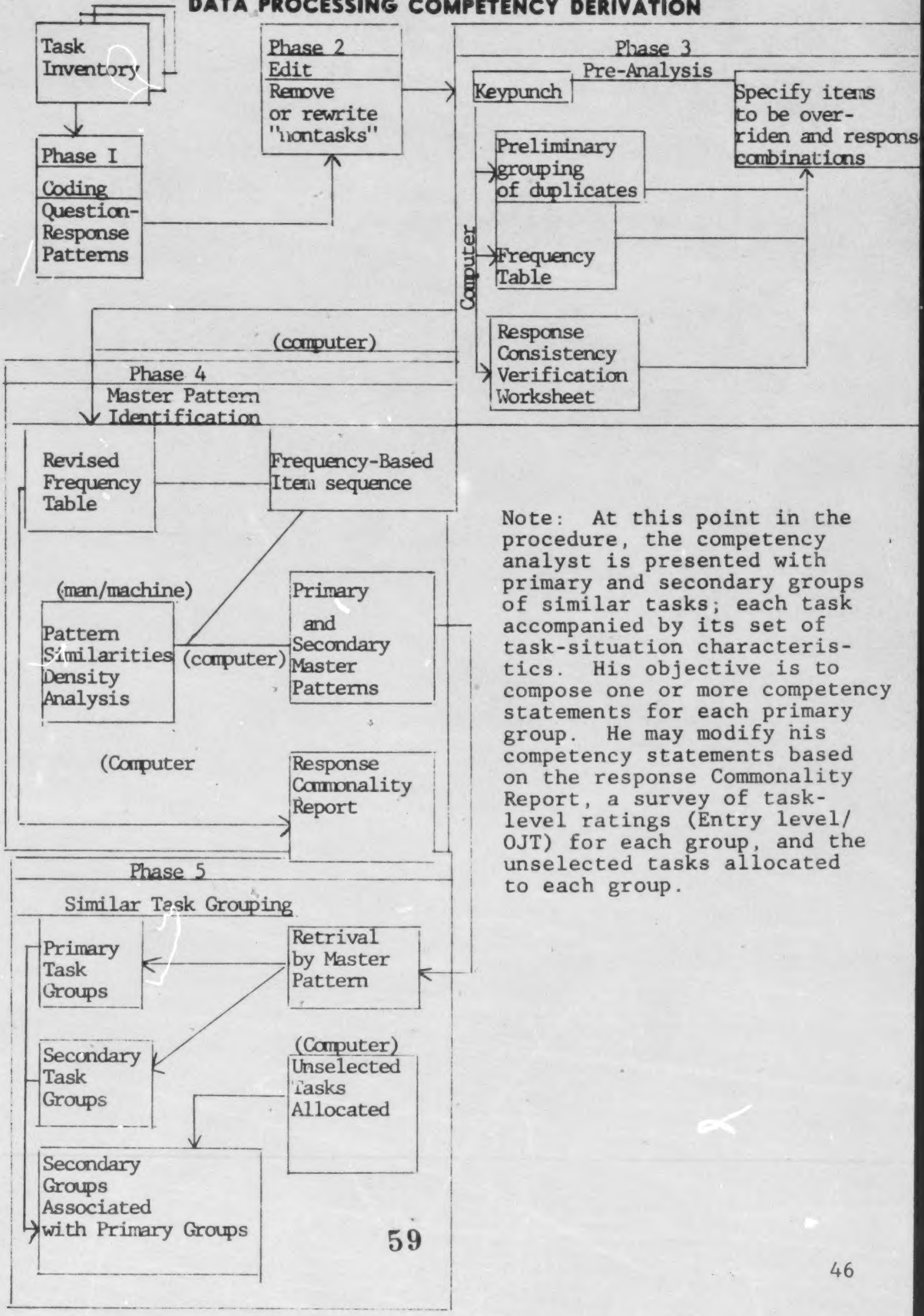
STATE DEPARTMENT OF EDUCATION
RESPONSE ORDERED FREQUENCY

QUESTION	ANSWER	COUNT
5	3	851
29	1	850
7	1	815
11		808
25		797
30	1	773
23	1	769
16	1	765
15	2	736
14	2	731
17	1	699
3	2	694
9	2	684
26		652
27		651
28		651
20	2	642
10		626
24	1	615
31	4	604
12		553
4	1	533
6	3	524
13		472
22	2	425
21	3	421
22	1	421
8	1	390
19	2	357
8		335
13	1	322
18	3	320
12	1	305
2	8	296
2	1	279
18	2	276
4	3	237
21	2	237
24	2	219
6	2	209
18		204
19	5	203
27	1	202
28	1	202
21	1	198
20		196
10	2	185
19	4	160
26	2	150
31	2	148
6	1	125

Computer instructions, programs, and printouts were developed in conjunction with the activities already described. It would be misleading to overlook the advantages of close teamwork with the System Analyst in this regard. Fast turnaround and feedback of ideas in concrete form was in all instances both stimulating and comforting.

All processing of information up to the point of actually writing statements of common competency has been reported above. Figure 8 summarizes the man/machine procedure.

Figure 8
PROCEDURAL SUMMARY
DATA PROCESSING COMPETENCY DERIVATION


Task Inventory
Phase I
Coding
Question-Response Patterns
Phase 2
Edit
Remove or rewrite "nontasks"
Phase 3
Pre-Analysis
Keypunch
Specify items to be overriden and respons combinations
Preliminary grouping of duplicates
Computer
Frequency Table
Response Consistency Verification Worksheet
(computer)
Phase 4
Master Pattern Identification
Revised Frequency Table
Frequency-Based Item sequence
(man/machine)
Pattern Similarities Density Analysis
(computer)
Primary and Secondary Master Patterns
(Computer
Response Commonality Report
Phase 5
Similar Task Grouping
Primary Task Groups
Retrival by Master Pattern
Secondary Task Groups
(Computer)
Unselected Tasks Allocated
Secondary Groups Associated with Primary Groups

Note: At this point in the procedure, the competency analyst is presented with primary and secondary groups of similar tasks; each task accompanied by its set of task-situation characteristics. His objective is to compose one or more competency statements for each primary group. He may modify his competency statements based on the response Commonality Report, a survey of task-level ratings (Entry level/OJT) for each group, and the unselected tasks allocated to each group.

IV. DEVELOP MANUAL PROCEDURES TO USE MACHINE-GENERATED INFORMATION

Input to this phase is the series of printouts outlined on the previous illustration. It consists of:

1. Primary groups of similar tasks
2. Supplementary groups of similar tasks.
3. Response commonality report
4. Non-selected tasks
5. An additional set of 1-4 (above) restricted to tasks coded as "Entry Level."

Thus this input constitutes an analysis and loose organization of the original lists of task statements. The final manual process of developing competency requirements or statements is described below and illustrated with samples of the actual input produced for the demonstration cluster, Electricity-Electronics, as assembled for Master Pattern #1. (The illustrative printout samples have been compressed to fit report format requirements.)

Figure 9 is a facsimile of the printout of the 36 tasks retrieved using Master Pattern #1(only fifteen tasks shown). This is the basic display of task information used throughout the competency analysis process. At the left are the four parts of the unique task identification number arranged as shown immediately under the run date; i.e., starting at the upper left and proceeding clockwise, the first number is Cluster (C) the next is Occupation (O) the next is Task (T) and finally the Block (B). Thus the first task printed in the body of the display is from cluster 10, key occupation 07, block 01, and task number 30 (of block 1).

The task statement follows with room provided for two lines of print. The table of data at the right consists of question numbers across the top and response option number in column listed opposite each task statement. Thus for task 20, block 1 (the first shown) response option 8 was used for question 2. Figure 10 is a copy of the form used to collect and organize informaton from the lengthy printout.

In the demonstration cluster 10 primary groups of tasks were developed by the man/machine process. Two of these groups were sub-divided so as to identify 17 primary-group narrative summaries. Thirty-three supplementary-group narratives were developed in the same fashion.

Figure 9

```
TSKAL4                          STATE DEPARTMENT OF EDUCATION                                      PAGE NO   1

RUN DATE 01/06/76                   TASK ANALYSIS VERIFICATION
C   O                                                                                1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3
B   T             T A S K           D E S C R I P T I O N 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1


GROUP   1

10  07  MAKE VISUAL INSPECT OF APPL FOR DAMAGE            8 1 2 3 3 1   2     1   3 1 1 1       2 2 1 2         1 1 4
01  030

10  09  IDENT FUNC OF COMPONENTS IN AM IF AMP             8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  001

10  09  IDENT THE FUNC OF COMPONENTS IN AVC CKT           8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  009

10  09  IDENT THE FUNC OF COMPONENTS AUDIO PREAMP         8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  013

10  09  IDENT FUNC OF COMPONENTS IN DRIVER AMP            8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  017

10  09  IDENT FUNC OF COMPONENTS IN AUDIO OUTPUT          8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  021

10  09  IDENT FUNC OF COMPONENTS IN FM IF AMP             8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  025

10  09  IDENT FUNC OF COMPONENTS IN FM DET                8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  029

10  09  IDENT FUNC OF COMPONENTS IN STEREO DEMOD          8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  033

10  09  IDENT FUNC OF COMPONENTS IN PWR SUPPLY            8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  037

10  09  IDENT FUNC OF COMPONENTS IN TONE CONTROL CKT      8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  041

10  10  IDENT OPERATIN CHAR OF RECT CKT                   8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  002

10  10  IDENT TYPE OF FILTER USED AND ITS OPER CHAR       8 1 1 3 3 1   2         3 1 1 1       3 1 1 2         1 1 4
04  003

10  10  IDENT TYPE OF VOLTAGE REG AND OPER CHAR           8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  004

10  10  IDENT VOLTAGE DIVIDER NETWORKS                    8 1 2 3 3     2         3 1 1 1       3 1 1 2         1 1 4
04  005
```

Several were more closely related to Master Pattern #1 tasks, than to any of the other 16 groups. In this case, no change to the narrative summary was required. However, for most other primary narratives some degree of modification was necessary so that the final narrative included sufficient amplification to subsume the specific skills and knowledge implied by all the associated supplementary groups.

In addition, about 25 tasks which had not been retrieved by the man/machine process (non-selected tasks) were allocated to this summary, and some further modifications to the narrative were required. All non-selected tasks were accounted for by associationg them with either primary or supplementary group (s) or with a final summary narrative.

NOTE: A quick review of the manual procedure outlined above will make clear the nature of the process involved. Even though a particular group of tasks may appear somewhat at first glance because they are drawn from different occupations, use of the work situation correlated data enables the writer to effectively single out those aspects of the tasks which are "common". He then scans the original task statements to summarize task operations correlated with the "common" situation and state generally, the subject of the operation--that which is worked on.

Finally, a similar set of summaries is written for the Entry Level tasks. The last step in the write-up procedure is to compare total cluster narrative summaries with entry-level summaries. This comparison provided three results:

(a) Some entry-level summaries are clearly related to one total cluster summary. In these cases, the narrative summary must be finally revised in line with the less demanding requirements for performance skill and knowledge indicated in the entry-level tasks and summaries.

This yields a specification of work competency common to several occupations in the cluster in terms of behavioral operation and what is worked on at an entry level of competency mastery.

(b) The second result is that some entry-level narrative summaries are associated about equally with more than one total cluster narrative summary. In these cases,

Figure 10
TASKS WHICH MATCH MASTER PATTERN #1
(Preliminary Summary of Performance Indicators)

1. Narrative Summary	2. Commonality Data	3. Task Similarities	Task Differences
Identify function of components in complex video or radio assembly such as TV vertical output amplifier or radio tone control circuit	36 tasks 1 appliance repairman (damage inspection) 10 radio repairmen 25 TV repairmen (identify function of components)	a. medium/product: task is on (2,19) -information on function of hardware	no exceptions; circuits worked only difference
		b. material resources (5,6,7,8,10,11,13)	
		-site varies	" "
		-no tools or equipment	". "
		-no materials or parts	1 insignificant factor
		c. information resources (3,4,9,12,15,16,17,18, 19,21,29,30)	
		-oral instruction	1 significant factor
		-Tech. specs.; no "other" information	no exceptions
		-one procedure check; works independently and no product review needed	no exceptions
		-no measurements	" "
		-shape patterns commonly used (6,9,12-19,21,23-31)	"
		d. operations	
		-from 10 min to one hr.	1 exception;10 min or under
		-few steps before set-up;several after	no exceptions
		-no calculations	"
		-1 final test and 1 form	"
		-few or no interpersonal dependencies	"
		-routine worker interactions	"

it was usually required that most of the total-cluster narratives be modified somewhat. NOTE: The reason for this is that the relationships between entry-level and total-cluster narrative summaries are not all the same. For example, in one case the entry-level requirement may include fundamental knowledge also required by the total-cluster work specificaiton. In another case, the entry-level requirement may constitute performance needed to expand knowledge as a part of the learning of a total-cluster competency.

This final modification yields a specification compatible to those produced by step (a) above.

(c) The third result is that some total-cluster narrative summaries do not readily and clearly "fit" any of the available entry-level specifications. For the demonstration cluster these fell roughly into two groups; i.e., a group of work specifications clearly beyond entry-level in terms of degree of complexity or technical knowledge and a group clearly beyond-entry-level in terms of worker autonomy. This latter group included a considerable range of technical subject matter, but clearly required a maturity in self-direction in the working situation, beyond entry-level capability.

In terms of the illustrative example for Master Pattern #1, the preliminary summary shown in Figure 9 was modified in two "dimensions" by the procedures just described. First, the variety of equipment worked on was broadened. Second, the sophistication of required behavioral performance was sharply reduced. The result was as follows:

Final, Entry-Level Common Competency for the Electricity-Electronics Cluster

Accurately describe the general function of simple, electrical, electronic, and mechanical components of common radio equipment on household appliances or appliance controls, such as a transformer, a condenser, or a circuit breaker.

RECOMMENDATIONS

The following recommendations include those items which seem to be keyed to the successful development of a manpower/curriculum base for purposes of program planning and development.

(1) The manpower system should be developed on a common competency-base cluster concept. What comprises a common competency should be defined at the beginning of the project.

(2) The Dept. of Education should clearly define the clusters it will include in the manpower system. Reasonable minimum employment and job opening limits should exist for a cluster group of occupations to qualify as a cluster.

(3) The Dept. of Education should encourage the State Employment Division to use (a) structured questionaires and (b) the Bureau of Labor Statistics occupational projection formula for job openings. Preferably each state should participate in the Fed-State OES Program.

(4) The USOE publication Vocational Education and Occupations should be used to classify the occupations by USOE instructional program area.

(5) Volume II of the DOT should be used as the source to identify the universe of occupations.

(6) The supply component of the manpower system should include as minimum accurate public secondary and post-secondary output. If possible, only graduates "available for placement" should be included. This may be obtained by student followup surveys.

(7) Once the manpower system is completed, a plan should be devised to disseminate the information, including provisions for evaluation and feedback.

(8) Persons presently in business or industry should be inserviced and contracted to compile task inventories instead of teachers, as too often teachers tend to be biased and want to include the "how and why" rather than staying

to the specific tasks needed to hold employment in the occupation.

(9) Occupational screening committees should reflect state-wide employment rather than be limited to a specific geographical area.

(10) Even though individuals from business and industry are often willing to assist education, quicker response to end products is usually obtained if the individual is contracted and paid for services rendered.

(11) Individualized modules should facilitate various "modes of learning" to increase student interest and learning retention.

(12) Individualized modules should include as many attractive illustrations so as to appeal to the learner.

(13) In order to increase teacher use of learner modules, they should be designed in a systematic delivery system including pre and post-tests, accompanying multi-media, diagnostic and prescriptive instruments and recordkeeping materials.

Appendixes

APPENDIX A

Sample Task Analysis

*TV SERVICE AND REPAIR

OCCUPATIONAL ANALYSIS

State Department Code # 1010
U.S.O.E. Instructional Group Code: 17.150300
D.O.T. # 720 281 018

RINCIPAL INVESTIGATORS

tate Department Specialist: JOHN HAVERY

urriculum Staff Assigned: JERRY LUDLOW

ask Analyst (s): BOB LEHMAN

ate Analysis Completed: AUGUST 1975

*NOTE: This occupation is a key occupation in Oregon as identified by Oregon Criteria.

TASK INVENTORY REVIEW COMMITTEE

JAMES A. ROLISON--ELECTROMATIC, INC. (PORTLAND)
GEORGE MAGER--ELECTROMATIC, INC. (PORTLAND)

MR. PARKER--A-P TV (OREGON CITY)

HENRY "BUD" RIMMER--MC NAUGHTON'S MILWAUKIE TV (MILWAUKIE)

GENE MC NAMEE--SEARS ROEBUCK & CO. (PORTLAND)
JIM GOODKNIGHT--SEARS ROEBUCK & CO. (PORTLAND)

DON SPORE--SUNSET TV SERVICE (PORTLAND)

TOM BULL--TOM'S TV CLINIC (LAKE OSWEGO)
DENNIS DUNLAP--TOM'S TV CLINIC (LAKE OSWEGO)

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COORDINATOR,
CURRICULUM DEVELOPMENT
CAREER EDUCATION

TASK INVENTORY

Page 1

TV Service and Repair
Job Title

Bob Lehman
Analyst

INSTRUCTIONS:

List each manipulative and knowledge skill relating to the job noted above. To the right of each task is a series of columns asking specific questions about the entry level, level of difficulty, frequency, and type of skill involved. Place an "X" in each of the four categories opposite the task description. (Definitions on back).

Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
		Runs Trans Line in the Attic	x		x			x		
1	1	Price out service charges on order	x		x					x
	2	Price out materials charges on order	x		x					x
	3	Figure repair time	x		x					x
	4	Write understandable report of work done	x		x					x
	5	Make out warranty forms	x			x				x
	6	Schedule service calls by priority	x		x					x
	7	Schedule service calls by geography of area	x		x					x
	8	Inform customer of charge	x		x					x
	9	Question customer without offending	x		x					x
	10	Take customer order for service	x		x					x
	11	Ident warranty status of parts of labor		x	x					x
	12	Use parts catalog to order replace part	x		x					x
	13	Fill out work order correctly	x		x					x
	14	Sensitive to customer response	x			x				x
	15	Use correct spelling	x		x					x
	16	Legible Handwriting	x		x					x
	17	Personal Hygiene	x		x					x
	18	Add columns of numbers	x		x					x
	19	Figure percentages	x		x					x
	20	Subtract discounts	x		x					x
	21	Make change correctly	x		x					x
	22	Explain work done in lay terms	x		x					x
2	1	Deliver customer's set	x		x					x
	2	Drive delivery truck	x			x				x
	3	Operate moving dollies	x		x				x	
	4	Locate delivery address	x		x					x
	5	Remove and drive screws	x		x					x
	6	Remove and tighten bolts	x		x					x
	7	Connect and disconnect elect jacks and plugs	x		x			x		
	8	Dress or position wiring	x		x					x
	9	Use wiring diag to make electric connect	x		x					x
	10	Use assembly and disassembly instructions	x		x					x
	11	Relate picture defect to cust cont misadj	x		x					x
	12	Relate sound defect to cust cont misadj	x		x					x
	13	Correct pic defect by adj customer controls	x		x					x
	14	Correct aud defect by adj customer controls	x		x					x
	15	Instruct customer on correct use of controls	x		x				x	
	16	Relate pic defect to service control misadj	x		x					x
	17	Relate sound defect to serv control misadj	x		x					x
	18	Correct pic defect by adj service controls	x		x					x

TASK INVENTORY

Page 2

TV Service and Repair
Job Title

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Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
2	19	Correct sound defect by adj service controls	x		x				x	
	20	Do color convergence with instructions	x		x			x		
	21	Do color convergence from memory	x			x		x		
	22	Selects correct mech fasteners ant install	x		x				x	
	23	Selects suitable location on building for ant	x		x				x	
	24	Makes Mech connect to wood metal or masonry	x		x				x	
	25	Selects point of entry for trans line		x	x				x	
	26	Makes weather proof trans line entrance	x		x				x	
	27	Selects appropriate type of trans line		x		x			x	
	28	Selects appropriate type of ant		x		x			x	
	29	Runs trans lines in walls		x	x			x		
	30	Fishes trans lines in finished walls		x		x		x		
	31	Installs lead-in terminal boxes		x	x				x	
	32	Installs imped match devices on trans line	x		x				x	
	33	Select sig gen for TV sound I F align	x		x					x
	34	Connect gen for sound I F align	x		x					x
	35	Connect oscope OBS sound I F bandpass curve	x		x					x
	36	Ident normal or acceptable bandpass curve	x			x				x
	37	Make proper adj to correct abnormal curve		x		x				x
	38	Select sig gen suitable for video I F align	x		x				x	
	39	Connect sig gen for video I F align	x		x				x	
	40	Connect oscope OBS video I F bandpass curve	x		x				x	
	41	Connect and adj bias control supplies	x		x				x	
	42	Ident norm B + W video I F bandpass curve		x		x			x	
	43	Ident norm color video I F band pass curve		x		x			x	
	44	B + W adj traps + trans to norm I F curve		x		x			x	
	45	Color adj traps + trans to norm I F curve		x		x			x	
	46	Select sig gen suitable for chroma align	x		x				x	
	47	Connect sig gen for chroma align	x		x				x	
	48	Identify norm chroma waveforms and curves		x		x			x	
	49	Adj traps coils + Tran correct chroma curves	x			x			x	
3	1	Ident pic symptoms of vert OSC trouble	x			x			x	
	2	Ident norm input output waveforms vert OSC	x		x				x	
	3	Connect oscope to OBS input sig to vert OSC	x		x				x	
	4	Connect oscopt to OBS output sig to vert OSC	x		x			x		
	5	Replace vert OSC module or plug in board		x	x				x	
	6	Ident prob requiring discrete circuit diag		x		x			x	
	7	Ident pic symptoms of vert output trouble	x			x			x	
	8	Ident norm input output waveforms vert out	x		x				x	
	9	Connect oscope to OBS input sig vert out	x		x				x	
	10	Connect oscope to OBS output sig vert out	x		x				x	

TASK INVENTORY

Page 3

TV Service and Repair
Job Title

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Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
3	11	Replace vert output module or plug-in board		x	x				x	
	12	Ident prob requiring discrete cird diag		x		x			x	
	13	Ident pic symptoms of hor OSC trouble	x		x				x	
	14	Ident norm input output waveforms hor OSC	x		x				x	
	15	Connect oscope OBS input sig to hor OSC	x		x				x	
	16	Connect oscope OBS output sig to hor OSC	x		x				x	
	17	Replace hor OSC module or plug-in board		x	x				x	
	18	Ident prob requiring discrete circ diag		x		x			x	
	19	Ident pic symptoms of hor output trouble	x			x			x	
	20	Ident norm input output waveforms hor out								
	21	Connect oscope to OBS input sig to hor out	x		x				x	
	22	Connect voltmeter with hi voltage probe	x		x				x	
	23	Replace hor output module or plug-in board		x	x				x	
	24	Ident problem requiring discrete circ diag		x		x			x	
	25	Ident pic symptoms hi voltage circ touble	x			x			x	
	26	Ident norm input output wavefrms hi volt rec	x		x				x	
	27	Use oscope OBS input wavefrms hi volt rect	x		x				x	
	28	Connect voltmeter with hi volt probe	x		x				x	
	29	Ident problem requiring discrete circ diag		x		x			x	
	30	Ident pic symptoms of hor AFC circ trouble	x			x			x	
	31	Ident norm input output waveforms hor AFC	x		x				x	
	32	Connect oscope to OBS input sig to hor AFC	x		x				x	
	33	Connect oscope to OBS output sig to hor AFC	x		x				x	
	34	Replace hor AFC module or plug-in circ board		x	x				x	
	35	Ident problem requiring discrete circ diag		x		x			x	
	36	Ident pic symptoms of sync sep trouble	x			x			x	
	37	Ident norm input output wavefrms of sync sep	x		x				x	
	38	Use oscope to OBS input sig to sync ser	x		x				x	
	39	Use oscope to OBS output sig of sync sep	x		x				x	
	40	Replace sync sep module or plug-in circ bd		x	x				x	
	41	Ident problem requiring discrete circ diag		x		x			x	
	42	Ident pic or aud symp of agc circ trouble	x			x			x	
	43	Ident norm input output waveforms agc circ	x			x			x	
	44	Connect oscope to OBS input sig to agc	x		x				x	
	45	Connect oscope to OBS output sig from agc	x		x				x	
	46	Replace agc module or plug-in circ board		x		x			x	
	47	Ident problem requiring discrete circ diag		x		x			x	
	48	Ident pic symptoms of video amp trouble	x		x				x	
	49	Ident norm input output waveforms video amp	x		x				x	
	50	Use oscope to OBS input sig to video amp	x		x				x	
	51	Use oscope OBS output sig from video amp	x		x				x	
	52	Replace video amp module or plug-in circ bd		x		x			x	
	53	Ident problem requiring discrete circ diag		x		x			x	

TASK INVENTORY

Page 4

TV Service and Repair
Job Title

INSTRUCTIONS:

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Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
3	54	Ident pic symptoms of pic tube circ trouble	x		x				x	
	55	Ident norm input sig waveforms of pic tube	x		x				x	
	56	Use oscope to OBS input sig to pic tube	x		x				x	
	57	Ident problem requiring discrete circ diag		x		x			x	
	58	Ident pic symp of video detector trouble	x		x				x	
	59	Ident norm input output sig video detector	x		x				x	
	60	Use oscope to OBS input sig to video det	x		x				x	
	61	Use oscope to OBS output sig from video det	x		x				x	
	62	Connect sig injector to video detector input	x		x				x	
	63	Replace video det module or plug-in circ bd		x		x			x	
	64	Ident prob requiring discrete circ diag		x		x			x	
	65	Ident pic sound symp video I F amp trouble	x			x			x	
	66	Ident norm input out sig wavefrms video I F	x			x			x	
	67	Use oscope to OBS input sig to video I F	x		x				x	
	68	Use oscope to OBS output sig of video I F	x		x				x	
	69	Connect sig injector to video I F amp	x		x				x	
	70	Replace video I F module plug-in circ board		x		x			x	
	71	Ident prob requiring discrete circ diag		x		x			x	
	72	Ident pic and sound symp of tuner trouble	x		x				x	
	73	Ident norm output sig waveforms of tuner	x			x			x	
	74	Connect oscope to OBS output sig of tuner	x		x				x	
	75	Connect sig injector to tuner input	x		x				x	
	76	Replace tuner		x		x		x		
	77	Ident sound symp of sound I F AMP trouble	x		x				x	
	78	Connect sig injector to sound I F input	x		x				x	
	79	Connect sig injector to sound I F output	x		x				x	
	80	Replace sound I F module or plug-in circ bd	x		x				x	
	81	Ident prob requiring discrete circ diag		x	x				x	
	82	Ident sound symp of FM sound det trouble	x		x				x	
	83	Connect sig injector to input sound det	x		x				x	
	84	Connect sig injector to output sound det	x		x				x	
	85	Replace sound det module or plug-in circ bd	x		x				x	
	86	Ident prob requiring discrete circ diag	x		x				x	
	87	Ident sound symp of audio amp trouble	x		x				x	
	88	Connect sig injector to input of audio amp	x		x				x	
	89	Replace audio module or plug-in circ board	x		x				x	
	90	Ident prob requiring discrete circ diag	x		x				x	
	91	Ident pic or sound symp of power supply	x		x				x	
	92	Ident norm output waveforms of power supply	x		x				x	
	93	Ident norm output voltages of power supply	x		x				x	
	94	Use oscope OBS volt waveforms of pwr supply	x		x				x	
	95	Use voltmeter measure volt of pwr supply	x		x				x	
	96	Use ammeter measure current pwr supply	x		x			x		

TASK INVENTORY

Page 5

TV Service and Repair
Job Title

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uty o.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
3	97	Ident prob requiring discrete circ diag	x			x			x	
	98	Ident pic symp of color phase detect	x		x				x	
	99	Ident norm input out sig wavefrms color det	x		x				x	
	100	Use oscope to OBS color det input sig	x		x				x	
	101	Use oscope to OBS color det output sig	x		x				x	
	102	Replace color phase det mod or plug-in circ		x		x			x	
	103	Ident prob requiring discrete circ diag		x		x			x	
	104	Ident pic symp of color demodulator trouble	x			x			x	
	105	Ident norm input out sig wavefrm color demod	x		x				x	
	106	Use oscope to OBS color demod input sig	x		x				x	
	107	Use oscope to OBS color demod output sig	x		x				x	
	108	Replace color demod mod or plug-in circ bd		x		x			x	
	109	Ident prob requiring discrete circ diag		x		x			x	
	110	Ident pic symp of convergence circ trouble	x			x			x	
	111	Ident norm converg input output sig waveform	x		x			x		
	112	Use oscope to OBS convergence input sig	x		x				x	
	113	Use oscope to OBS convergence output sig	x		x				x	
	114	Replace convergence module of plug-in circ		x		x			x	
	115	Ident prob requiring discrete circ diag		x		x			x	
	116	Ident pic symp of bandpass amp trouble	x			x			x	
	117	Ident norm bandpass amp input output sig	x			x			x	
	118	Use oscope to OBS bandpass input waveform	x		x				x	
	119	Use oscope to OBS bandpass output waveforms	x		x				x	
	120	Replace bandpass amp mod or plug-in circ bd		x		x			x	
	121	Ident prob requiring discrete circ diag		x		x			x	
	122	Ident pic symp of burst amp trouble	x			x			x	
	123	Ident norm burst amp input and output sig	x		x				x	
	124	Use oscope to OBS burst amp input waveform	x		x				x	
	125	Use oscope to OBS burst amp output waveform	x		x				x	
	126	Replace burst amp mod or plug-in circ bd		x		x			x	
	127	Ident prob requiring discrete circ diag		x		x			x	
	128	Ident pic symptoms of color killer trouble	x		x				x	
	129	Ident norm color killer input and output sig	x		x				x	
	130	Use oscope OBS color killer input waveform	x		x				x	
	131	Use oscope OBS color killer output waveform	x		x				x	
	132	Replace color killer circ module	x		x				x	
	133	Ident prob requiring discrete circ diag	x		x				x	
	134	Ident pic symp color sub-carrier OSC trouble	x			x			x	
	135	Ident norm sub-carrier OSC input output sig	x			x			x	
	136	Use oscope to OBS sub-carrier input waveform	x		x			x		
	137	Use oscope OBS sub-carrier output waveform	x			x		x		
	138	Replace sub-carrier OSC module		x		x			x	
	139	Ident prob requiring discrete circ diag		x		x			x	

TASK INVENTORY

Page 6

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			Entry Level		Level of Difficulty			Frequency		
Duty No.	Task No.	Task Description	Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
4	1	Ident type of rectifier circ used	x		x				x	
	2	Ident operating char of rectifier circ	x		x				x	
	3	Ident type of filter used and its oper char	x		x				x	
	4	Ident type of voltage reg and oper char	x		x				x	
	5	Ident voltage divider networks	x		x				x	
	6	Measure circ volt currents and waveforms	x		x					x
	7	Ident faulty component(s) ind by readings	x			x			x	
	8	Clean tuner switch contacts	x			x				x
	9	Ident function of components in I F amp	x			x			x	
	10	Determine point I F amp sig is abnormal	x			x			x	
	11	Measure interpret meaning of static voltages	x			x				x
	12	Ident faulty component(s) indicated	x			x			x	
	13	Ident func of components video det stage	x		x				x	
	14	Ident point video det stage sig abnormal	x		x				x	
	15	Measure interpret meaning static voltages	x		x				x	
	16	Ident faulty component(s) ind by readings	x		x				x	
	17	Ident function components video amp stage	x		x				x	
	18	Ident point video amp sig becomes abnormal	x			x			x	
	19	Measure interpret meaning static voltages	x			x				x
	20	Ident faulty component(s) by readings	x			x			x	
	21	Ident function components pic tube circ	x		x				x	
	22	Ident point pic tube circ sig becomes abnorm	x		x				x	
	23	Measure and interpret meaning of static volt	x		x			x		
	24	Ident faulty component(s) ind by readings	x			x			x	
	25	Ident function components sync sep stage	x			x			x	
	26	Ident point sync sep sig becomes abnormal	x		x				x	
	27	Measure interpret meaning static voltages	x			x				x
	28	Ident faulty component(s) ind by readings	x			x				x
	29	Ident function of components in agc circ	x			x			x	
	30	Ident point agc circ sig becomes abnormal	x		x				x	
	31	Measure interpret meaning static voltages	x			x				x
	32	Ident faulty component(s) ind by readings	x			x				x
	33	Ident function component(s) vert output amp	x		x				x	
	34	Ident point vert output amp sig is abnorm	x			x			x	
	35	Measure interpret meaning static voltages	x			x				x
	36	Ident faulty component(s) ind by readings	x			x				x
	37	Ident function components vert sweep OSC	x			x			x	
	38	Ident point vert OSC sig becomes abnormal	x			x			x	
	39	Measure interpret meaning static 50L3 75								
	40	Ident faulty component(s) ind by readings	x			x				x
	41	Ident function of component(s) in hor OSC	x			x			x	
	42	Determine point hor OSC sig becomes abnormal	x		x				x	
	43	Measure interpret meaning static voltages	x			x				x

TASK INVENTORY

Page 7

TV Service and Repair
Job Title

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Analyst

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Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
4	44	Ident faulty component(s) ind by readings	x			x				x
	45	Ident function component(s) hor AFC circ	x			x			x	
	46	Determine point hor AFC sig is abnorm	x			x			x	
	47	Measure interpret meaning static voltages	x			x			x	
	48	Ident faulty component(s) ind by readings	x			x			x	
	49	Ident function component hor swp output amp	x			x			x	
	50	Ident point hor output sig becomes abnorm	x			x			x	
	51	Measure interpret meaning static voltages	x			x			x	
	52	Ident faulty component(s) ind by readings	x			x			x	
	53	Ident func components hi volt supply circ	x			x			x	
	54	Ident point hi volt supply sig is abnorm	x			x			x	
	55	Measure interpret meaning static voltages	x			x			x	
	56	Ident faulty component(s) ind by readings	x			x			x	
	57	Ident function components sound I F amp	x		x				x	
	58	Ident point sound I F amp is abnorm	x		x				x	
	59	Measure interpret meaning static voltages	x			x			x	
	60	Ident faulty component(s) ind by readings	x			x			x	
	61	Ident function of components in sound det	x		x				x	
	62	Ident point sound det sig is abnormal	x		x				x	
	63	Measure interpret static voltages sound det	x		x				x	
	64	Ident faulty component ind readings	x		x				x	
	65	Ident function components audio amp	x		x				x	
	66	Determine point audio amp sig is abnormal	x		x				x	
	67	Measure interpret meaning static voltages	x		x				x	
	68	Ident faulty component(s) ind by readings	x		x				x	
	69	Ident function components color phase det	x		x				x	
	70	Ident point color det sig becomes abnorm		x		x			x	
	71	Measure interpret meaning static voltages		x		x			x	
	72	Ident faulty component(s) ind by readings		x		x			x	
	73	Ident func components color sub-carrier OSC	x			x			x	
	74	Ident point sub-carrier OSC sig is abnorm		x		x			x	
	75	Measure interpret meaning static voltages		x		x			x	
	76	Ident faulty component(s) ind by readings		x		x			x	
	77	Ident function components color killer circ	x			x			x	
	78	Ident point color killer sig is abnorm		x		x			x	
	79	Measure interpret meaning static voltages		x		x			x	
	80	Ident faulty component(s) ind by readings		x		x			x	
	81	Ident function of components in burst amp	x		x				x	
	82	Ident point burst amp sig is abnormal		x		x			x	
	83	Measure interpret meaning static voltages		x		x			x	
	84	Ident faulty component(s) ind by readings		x		x			x	
	85	Ident function components bandpass amp	x			x			x	
	86	Ident point bandpass amp sig is abnormal		x		x			x	

TASK INVENTORY

Page 8

TV Service and Repair
Job Title

Bob Lehman
Analyst

INSTRUCTIONS:

List each manipulative and knowledge skill relating to the job noted above. To the right of each task is a series of columns asking specific questions about the entry level, level of difficulty, frequency, and type of skill involved. Place an "X" in each of the four categories opposite the task description. (Definitions on back).

Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
4	87	Measure interpret meaning static voltages		x		x			x	
	88	Ident faulty component(s) by readings		x		x			x	
	89	Ident function components color demod	x			x			x	
	90	Ident point color demod sig is abnorm		x		x			x	
	91	Measure interpret meaning stage voltages		x		x			x	
	92	Ident faulty component(s) ind by readings		x		x			x	
	93	Ident function components convergence circ	x			x			x	
	94	Ident point conver circ sig is abnorm		x		x			x	
	95	Measure interpret meaning stage voltages		x		x			x	
	96	Ident faulty component(s) ind by readings		x		x			x	
5	1	Relate physical resistor to schematic	x		x					x
	2	Ident coded resistor parameters	x		x					x
	3	Test resist value (in circuit)	x		x					x
	4	Test resist value (out of circuit)	x		x					x
	5	Evaluate result of resistance measurement	x		x					x
	6	Ident phys signs resistor deterioration	x		x					x
	7	Evaluate effect of electrical char in circ	x		x					x
	8	Relate physical capacitor to schematic	x		x					x
	9	Ident coded cap parameters	x		x					x
	10	Quick check cap in circ with ohmmeter	x		x					x
	11	Test capacitor out of circ with cap tester	x		x					x
	12	Evaluate results of cap quality tests	x		x					x
	13	Evaluate effect of elec char of cap on circ	x		x					x
	14	Ident physical signs of cap deterioration	x		x					x
	15	Relate physical inductor to schematic	x		x				x	
	16	Ident coded inductor parameters	x		x				x	
	17	Quick check inductor in circ with ohmeter	x		x				x	
	18	Evaluate results of inductance checks	x		x				x	
	19	Evaluate effects of elec char on circ	x			x			x	
	20	Ident phys signs inductor deterioration	x			x			x	
	21	Relate transformer to schematic	x		x				x	
	22	Ident transf parameters from schem/catalog	x		x				x	
	23	Quick check transf with ohmmeter	x		x				x	
	24	Evaluate results of trans tests	x		x				x	
	25	Evaluate effects of elec char on circ	x		x				x	
	26	Ident physical signs of trans deterioration	x		x				x	
	27	Relate tube to schematic	x		x					x
	28	Ident tube parameters from manual or schem	x		x					x
	29	Test tube by substitution	x		x					x
	30	Test tube in tube tester	x		x					x
	31	Evaluate results of tube tests	x		x					x

TASK INVENTORY

Page 9

TV Service and Repair

Job Title

Bob Lehman

Analyst

INSTRUCTIONS

List each manipulative and knowledge skill relating to the job noted above. To the right of each task is a series of columns asking specific questions about the entry level, level of difficulty, frequency, and type of skill involved. Place an "X" in each of the four categories opposite the task description. (Definitions on back).

Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
5	32	Evaluate effects of elec char on circ	x		x					x
	33	Ident physical signs of tube deterioration	x		x					x
	34	Relate specific sw or sw sect to schematic	x		x				x	
	35	Check switch with ohmmeter	x		x				x	
	36	Evaluate switch tests	x		x				x	
	37	Ident phys signs switch deterioration	x		x				x	
	38	Relate circ protector to schematic	x		x				x	
	39	Ident circ protector parameters from schem	x		x				x	
	40	Test tubes or circ breaker with ohmmeter	x		x				x	
	41	Evaluate results of circ protector tests	x		x				x	
	42	Ident phys signs circ protect deterioration	x		x				x	
	43	Test continuity of wiring or circ boards	x		x				x	
	44	Ident signs phys deteri wiring or circ board	x		x				x	
	45	Relate transistor to schematic	x		x					x
	46	Ident semicond device parameters from schem	x		x					x
	47	Check semicond device in circ with vom	x		x					x
	48	Check semicond device with in-circ tester		x	x					x
	49	Test semicond device out of circ	x		x				x	
	50	Evaluate results of semicond device tests	x		x					x
	51	Evaluate effects on elec char on circ	x		x					x
	52	Ident phys signs semicond device deter	x		x					x
	53	Test flyback tran with in circ tester		x		x		x		
	54	Test deflection yokes within circ tester		x		x		x		
	55	Test speaker	x		x					x
6	1	Unsolder component from circ board	x		x					x
	2	Unfasten component phys from circ board	x		x					x
	3	Unsolder component from hand wired circ	x		x				x	
	4	Unfasten component phys from wired circ	x		x				x	
	5	Use model and part no sel fact replaced part	x		x					x
	6	Use cross ref select univ replacement part	x		x				x	
	7	Mech install replace part on circ board	x		x					x
	8	Solder in replace part on circ board	x		x					x
	9	Mech install replace part hand-wired circ	x		x				x	
	10	Solder in replace part in hand-wired circ	x		x				x	
	11	Repair breaks or flaws on printed circ board	x		x				x	
	12	Repair or replace defective wiring	x		x				x	
	13	Make post repair test of set	x		x					x
	14	Clean controls (variable resistors)	x		x				x	

ANALYST QUESTIONNAIRE

1. Task Ident. / . / / . / / . / / . /
   Clustr. Occ. Blk. Tsk.

2. Task objective
   a) modifies static object or material--if so,is it
      1)processed material, or
      2)raw material
      3)both

   b) restores dynamic device or system to normal or improved function - if so, is it
      4)mechnical-power device or system
      5)electric-electronic device or system, or
      6)both (its function implements both mechnical power and electricity.

   c) changes or modifies information or data (including pictorial or schematic presentations - if so, does information refer to
      7)physical object or material
      8)dynamic properties, or function
      9)symbology/communication
      10)attitudes and/or interests of people
      11)more than one of the above

   d) to understand, clarify, or modify an idea or concept - if so, to
      12)learn
      13)communicate about
      14)both

   e) modify or influence a human attitude or interest or decision (including listening)
      15)individual
      16)group
      17)both

3. When a worker performs this task in most businesses, is he usually given any information (besides being told to "Do it") before he starts work? (to perform the task)

   If so, is this information
      1)instructions/supervisory
      2)technical;specification, nomenclature or codes, or other textual or pictorial or schematic
      3)motivational or ethical; such as
         "Careful! this customer is---"
         "You're the best man for this job"

4. Is the information
      1)usually written only
      2)usually oral only
      3)usually written and oral

RESOURCES

5. What forms of energy does the worker have available usually?
   1)electric
   2)fossil fuel
   3)both

6. In most businesses is the work space for this task
   1)fixed - the "work" is brought to the worker
   2)on-site...the worker walks or travel to a location where he then performs the task
   3)varies according to business and/or particular occupation.

7. When this task is performed is the situation stressful? (very noisy, an emergency, dangerous, rushed
   1)It might be, but only rarely
   2)In some businesses more than others
   3)Often

8. In most businesses what resources are usually needed by the worker personally?
   (TOOLS)
   1)primarily, hand tools
   2)most up-to-date workers use one or more power tools
   3)both 1 and 2

9. (INFORMATION)
   1)formal procedural reminder or "checklist"
   2)technical specifications and/or reference catalogs, manuals (in addition to the in Question 3)
   3)both 1 and 2

10. Does the task require that parts or materials be available?
    (PARTS)
    1)replacement subsystems(or supplied, as for an assembly task)
    2)replacement components
    3)both 1 and 2

11. (MATERIALS)
    1)materials (such as liquid, solid, gas)

12. (INFORMATION)
    1)other information than indicated in Questions 3 and 9

13. Is equipment (other than tools) usually used in most businesses to perform this task?
    1)Diagnostic equipment--measures or converts some aspect of the task medium (Question 1) to a visual or audible display.

2)Operational equipment--other than 1 (above) but usually available to help or be used in performing task activities.
3)both 1 and 2
4)Reporting/Recording/Accounting equipment--used to communicate during the task, or to record some aspect or effect of task activity, or to store expenses incurred, or any or all of these uses
5)All of the above

14. How many other people does the worker usually deal with in performing this task in most businesses?
1)almost always alone (photo darkroom)
2)occasionally alone--usually has some opportunities to converse with one or more other people.
3)almost always, this task is performed with other people around.
4)workers often "consult" other people as a part of this task in most situations.
5)in most businesses, the worker must deal with one or more other people to complete the task; e.g. to obtain parts, check procedure, coordinate, verify judgments, and so on.

TASK OPERATIONS - CONTROL

15. How many procedural tests are usually required (for the worker to be sure he's following the right procedure) (#18 covers tests of the task object itself)
1)one
2)2-4
3)5 or more

16. Is most of the control and direction for performance of this task provided by 9, 12, 15, 18, 19, 20, 21, 26, 27, 28
2)an immediate supervisor or "lead-worker"
3)some other source
4)2 and 3

17. How is the overall task sequence usually determined for this task?
1)by the worker as he works
2)in consultation with other people
3)both 1 and 2
4)by the worker himself using or adapting slightly, a standard procedure
5)following a task checklist (see Question 9) exactly
6)some combination of 1-5, above, plus a safety checklist

18. Are "tests" usually and normally required during this task prior to testing the finished product?

If yes, what units are used in expressing test results?

1).0001 - .1 in. (or similar range precision, such as a printer's scale, or smaller seconds and minutes of arc, milligrams, and such)
(STATIC) 2).1 in. - yards (or similar range of precision, such as rods, chains, meter, degrees of arc, pounds, dollars and cents, and such)
TESTING) 3)both 1 and 2
4)units larger than yards, meters, or chains (100 ft) units of what dynamic properties

19. DYNAMIC TESTING)
1)mechanical power or force (lbs/sq. in.,H.P., and so on)
2)electrical properties (volts,ohms,amperes,watts, and so on)
3)velocity (mi./hr., revolutions per minute or second)
4)physical properties (temperature,chemo-physical changes, color, angstroms, etc.)
5)other than one (1-4 above)

20. Indices of relationship (statistics, etc.) between things that change
1)yes
2)no
3)other

21. Are there any tests commonly used in this task in which the worker compares his work results to a standard pattern? (color, waveform, human response pattern, shape, textual or paper-form format, template,etc.)
1)no widely used patterns
2)some patterns used in a few situation
3)commonly established and accepted procedure

TASK OPERATIONS PROCEDURAL PATTERN CHARACTERISTICS

22. In most businesses, what is a reasonable time to allow for performance of this task?
1)under 10 minutes
2)somewhere between about 10 minutes to an hour
3)roughly, between 1 hour and 4 hours
4)usually, over four hours

23. Is it fairly easy to see this task as consisting of several steps or decision--points?(If it's not easy, don't answer 23, 24, 25

If it is easy, about how many steps for
("SET-UP") 1)1-3 steps
2)3-10 steps
3)over 10 steps

24. (AFTER "SET-UP")
1)1-3 steps
2)3-10 steps
3)10-20 steps
4)over 20 steps

25. Do any steps require dealing with other people in most businesses?
1)one to three steps
2)over three steps

26. Is the worker usually required to perform calculations at any point in the task?
If yes, does he usually do so
1)assisted by equipment or tools
2)based on measurements obtained
3)both
4)performs calculations,but neither 1 or 2 apply.

27. If he is usually required to perform calculations, how many factors must be considered in the most complicated calculation? (normally, in most, routine, situations)
1)under 3 factors
2)over 3 factors

28. What is a rough estimate of the total number of kinds of calculations usually performed during this task?
1)under 3 calculations
2)3-10 calculations
3)more than 10 different kinds of calculations or computations(he may have to calculate the same thing many times--that's one kind of calculation)

OUTPUT

29. When the task is finished, how many tests of the completed product are usually made?
1)1 or 2
2)3-5
3)over 5

30. How many forms (or other reporting/accounting devices) does the worker usually have to use, in most business, after the task is finished, or as last steps of the task? (time cards, work orders, billing, and such)
1)none or 1
2)2-4
3)over 4

31. In most businesses is this product
    1)formally accepted by a "customer"
    2)formally accepted by supervisory
    3)sometimes both
    4)no formal acceptance

("formal" is used to mean there is some kind of review or testing or evaluation which could result in the product being rejected)

APPENDIX C

Task Analysis Procedures

TASK ANALYSIS PROCEDURES

OREGON STATE DEPARTMENT OF EDUCATION
INSTRUCTION DIVISION
CAREER and VOCATIONAL EDUCATION

CONDUCTING A TASK INVENTORY

I. TASK INVENTORY PROCEDURE

A task inventory is a list of the duties and responsibilities of a worker in an occupation; it contains the knowledge and skills the worker should have if he is to be able to perform the steps which make up the occupation.

Career/vocational education relies on the task inventory as the most efficient method to gain the knowledge necessary to write curriculum for the many programs which make up the occupational clusters. There are basically two proven methods of conducting a task inventory. One method involves an interviewer who observes and interviews a number of workers performing the tasks in the occupation under study. A list of tasks is compiled; this list is then distributed to other workers in the occupation in the form of a questionnaire. They are asked to identify those tasks which they actually do and how frequently the task is performed. They are also asked to add tasks they do which are not listed. The results are then tabulated and the inventory finalized.

Another method is to hire a worker in the occupation to compile the inventory, then have the list of tasks validated by a committee of workers in that specific occupation. This second method is the way we have chosen for it does not require as much time and manpower as the other method.

A task inventory is only undertaken if a need exists. Once a need has been identified by the occupational/specialist, a search for existing task inventories and other relevant materials is conducted. Possible sources of materials are: The Task Inventory Exchange, The Ohio State University; The Curriculum Management Center, Olympia, Washington; U.S. Military Departments, school districts, Department of Education and commercial outlets.

If it is determined that a task inventory is necessary, the occupational specialist and the curriculum specialist establish a list of prospective analysts. Care must be exercised in selection of the analyst. Supervisory and management people are usually not a good choice, although they may be more grammatically competent to compile the inventory. But unless they are actively involved in the work it is better not to hire them. The most knowledgeable and competent person is the worker on the job.

The curriculum specialist interviews as necessary to determine the best person for the job. In the interview the need for the inventory and the process of compiling the inventory are explained. Sometimes it is necessary to explain what clusters are, what career education is, but many people are knowledgeable of education and are eager to do what they can to help.

The task inventory can be as detailed as desired, but basically subtasks are not considered. A sub-task is one of the minute steps necessary which make up the complete task, e.g. removing the screws which hold the brushes in a generator. An acceptable task statement might read, "Remove generator brushes." If it were felt necessary to detail just how this were accomplished, the statement "Remove generator brushes" would be a duty under which a detailed step-by-step process of how would be presented. And this brings up a point which is necessarily stressed; the object of the task inventory is to find out what is being done by the workers, and not how it is being done. The how is determined in a subsequent step called "Instructional Analysis."

Once the analyst has been hired, it is necessary to establish a series of follow-up meetings, to evaluate progress and assist the analyst in any way possible to get his information down on paper. At this juncture, it is not necessary to be demanding about sentence structure; information is what is wanted over sentence structure which can come later.

Once the initial copy of the inventory is received, the curriculum specialist reviews and edits the copy. He then usually meets with the analyst to assure that what the analyst originally said has been accurately interpreted and restated. This results in an improved copy of the inventory.

The analyst then assists the occupational and curriculum specialists in selecting prospective review committee members. The curriculum specialist interviews these people to explain why their time and expertise are needed. Here, again, care must be exercised to insure that committee members are close to the work the inventory details.

Once members are selected, a time and place for the committee meeting is set. Prior to the meeting taking place, each member of the committee is sent a copy of the inventory, along with instructions for review and correction. The review meeting is usually attended by the occupational specialist, the curriculum specialist, the analyst, and from three to six committee members. The meeting can be chaired by either the occupational specialist or the curriculum specialist.

The purpose of the meeting is to validate the task inventory. The committee members either verify that the task statements are descriptive of the occupation, or that they fail in some way to accurately describe the duties and responsibilities of the worker. If any committee member disagrees with a particular statement, he is asked to explain his objections. Whether a statement remains in the inventory or is removed depends on a consensus opinion. Similarly, any task identified as being absent must pass the same test before it is included.

Once the committee has approved the inventory, it is printed in final form and distributed to all those who are actively involved in producing it. The next step, the instructional analysis, is now ready to begin.

THE TASK STATEMENT

One of the basic steps in the development of vocational education curricula is the Task Inventory. The task inventory is a list of Task Statements containing the duties and responsibilities that a worker must concern himself with if he is to do his job safely, efficiently, and in a reasonable amount of time. The task inventory is written by a worker in the occupation under study. He should understand the importance of the inventory, and be coached in writing task statements. You are cautioned, however, not to be overly demanding of the analyst and require him to be punctually correct in the structure of the task statement. The primary purpose of the inventory is to find out WHAT the worker is doing. Most analysts will write knowledge or understanding statements. These ARE NOT task statements, however, careful editing and re-structuring can produce a statement which shows a task being performed which encompasses the knowledge or understanding specified.

I. The task statement tells only WHAT is being done, and not necessarily HOW or WHY it is being done. To do this it begins with a verb, depicting an observable action which occurs within a specific, continuous period of time, which allows the reader to clearly "see" what the worker is doing.

EXAMPLE: Use calculator to total columns of figures
Refer to manufacturer's manual for torque specifications
Perform visual inspection of bearings for pitting and chipping

II. Task statements are written in present tense, first person singular, with the subject "I" understood. The writer is speaking of himself performing the task.

EXAMPLE: (I) use torque wrench to tighten valve body bolts
(I) perform visual inspection of bearings

III. The plural "s" must not be used, ("greets" customer, "gives" injection","types" letters). These statements are not first person singular. Here the writer is speaking about someone else doing the job. The reader must not wonder what "greets" customer means: A handshake? An embrace? A casual verbal acknowledgment? Remember: the reader must be able to clearly "see" the worker performing the task.

IV. (A) Avoid the use of "and/or" and "etc"; both terms lead to ambiguity and confusion.

EXAMPLE: Use file and/or emery cloth to remove burrs, rough edges, etc.

If more than one method is to be identified, use two statements.

EXAMPLE: Use file to remove sharp edges
Use emery cloth to polish rough surfaces

(B) Avoid the use of vague and ambiguous words such as, "check", "assure", "determine".

EXAMPLE: Check pressure in lines (does this mean stop? measure? observe?)
Determine customer need

Remember: the task statement is not concerned with HOW the task is performed, but with WHAT is being done. "Determine customer need" does not say very much. This could easily be written:

"Interview customer to establish hair style desired"

V. (A) Avoid numeration of trivial or sub-tasks.

EXAMPLE: Turn ignition key
Insert ribbon in typewriter

The engine must be running for the idle speed to be adjusted; the typewriter must have a ribbon if a letter is going to be typed. These are examples of prerequisites which are inferred from the task statement and need not be enumerated.

(B) Avoid the too-general task statement.

EXAMPLE: Fill out necessary pre-sale forms
Overhaul engine

There is too much information being left out of these statements. The reader cannot get a clear picture of the worker performing a specific task, but rather has a blurred picture of several actions being performed at one time.

VI. The task statement is not concerned with the qualifications, traits, or aptitudes of the worker.

EXAMPLE: Be neat and clean
Should have High School diploma
Will have responsibility for supervision of others

These are important, nice-to-have qualifications, but they are not tasks.

VII. There are tools, machines, instruments, knowledge that a worker may use in performing his job. Every concerned practitioner of his art wants a new employee to be able to use, or at least be familiar with, the tools of his trade and to possess the knowledge to make intelligent decisions. It is necessary that this information be included in the task inventory, but in such a manner that the reader can see the worker performing a task, using the tool, or employing the knowledge.

EXAMPLE: Must know how to use tune-up equipment
Understand zoning ordinances
Must be able to type

For the reader to see someone using the knowledge and understanding mentioned in the above statements, they can be re-written thus:

Use cylinder balance test to locate malfunctioning cylinder
Use county zoning ordinance to locate building
Type work order estimate

The foregoing should give the reader a basic understanding of what the task statement is and how it can be written. It would be nice if all analysts used the desired terminology, but it is being overly optimistic to expect this. The writer should be permitted to offer the information in the best way he can, hopefully in the form of sentences and on a prescribed form. It will be the responsibility of the specialist to edit the list and put the statements into the language desired.

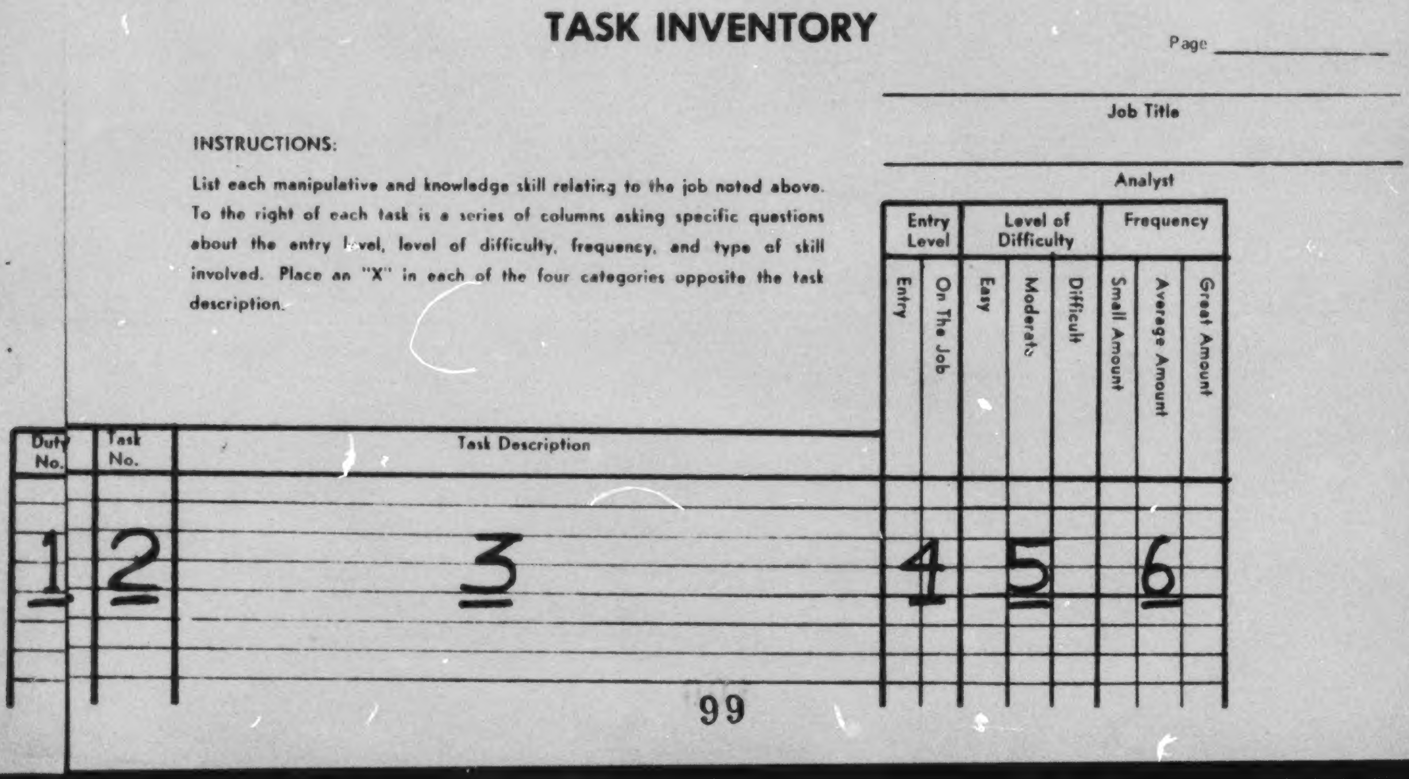
Following are some examples of acceptable task statements.

PERFORM	visual inspection of bearings
LOCATE	valve specifications in manufacturer's manual
PLAN	a training program for sales personnel
CONDUCT	in-service class for instructors
PREPARE	annual report for auditor
COUNSEL	new employees on company regulations
DEMONSTRATE	proper method of reading plastigage
ESTIMATE	cost of radio repair
TRAIN	new personnel in cash register operation
INTERVIEW	prospective employee
WRITE	work repair order
USE	pencil to record temperature on chart
MEASURE	E I R + Z of components using voltmeter
DRAW	schematics of circuits
IDENTIFY	unit prices from symbols
ADJUST	engine idle speed
REMOVE	broken bolt with E-Z out

THE TASK INVENTORY FORM

When giving instruction to the analyst outlining the kinds of information needed and how that information is to be recorded, particular attention should be given to the Task Inventory form. Fairly strict guidelines for recording the information requested must be established and adhered to, for unless this is done, analysts may interpret meanings wrongly with the result that erroneous information will be recorded.

Illustrated below is the Task Inventory form used by the Oregon Department of Education. In the upper right hand corner, the page number, Job Title and Analyst are identified. These should appear on each page of the inventory to insure against loss or misplacement.



TASK INVENTORY

Page ______________

Job Title

Analyst

INSTRUCTIONS:

List each manipulative and knowledge skill relating to the job noted above. To the right of each task is a series of columns asking specific questions about the entry level, level of difficulty, frequency, and type of skill involved. Place an "X" in each of the four categories opposite the task description.

Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
1	2	3	4			5			6	

Care must be exercised when explaining the form to the analyst. Columns four, five and six require subjective analysis and apply only to the analyst and his job. No two people see anything the same way, and this applies particularly to how people view their job. The analyst may say that a particular task is easy and that it is performed an average amount of the time; anyone is free to disagree with him, although this is his determination and cannot really be argued with. He may be a person for whom things come easy, but to others it could be moderate to difficult. Also, a task that is performed an average amount of the time for one person may to another only be performed sporadically.

Column One, DUTY NO.

"DUTY" identifies a general area. In Industrial Mechanics, for example, one duty would be the BRAKE SYSTEM. The duty is always identified by a Zero in the TASK column, and is identified by name in the TASK DESCRIPTION column.

EXAMPLE:

Duty No.	Task No.	Task Description
1	0	BRAKE SYSTEM

Column Two, TASK NO., Column Three, TASK DESCRIPTION.

Each task identified as belonging to the BRAKE SYSTEM would be entered, numbered and named.

EXAMPLE:

Duty No.	Task No.	Task Description
1	0	BRAKE SYSTEM
	1	Fill master cylinder with proper fluid
	2	Use pressure tank to bleed system
	3	Use brake spring pliers to remove brake shoe springs

When all tasks have been identified in the BRAKE SYSTEM, another duty area will be identified, e.g., TUNE-UP.

EXAMPLE:

Duty No.	Task No.	Task Description								
1	0	BRAKE SYSTEM								
	1	Fill master cylinder with proper fluid								
	2	Use pressure tank to bleed system								
2	0	TUNE-UP								
	1	Use strobe light to align degree pointer								
	2	Use dwell meter to adjust point dwell								

Columns Four, Five and Six

The analyst is required to select one answer only in each column and to place an 'X' under the heading which best describes the Entry Level requirements, Level of Difficulty of the task, and the Frequency of each task.

ENTRY, under Entry-Level, means that the prospective employee should have this ability when applying for the job. If it is not necessary to be able to perform this task to get the job, then it would be designated "On-the job", meaning the task can be, or will be, learned after employment.

Column FIVE offers three options: Easy, Moderate, Difficult. Remember that this is purely a subjective area. Review committee members may disagree with any of the analysts' selections here, and frequently do. The final determination is a consensus of the committee.

Column SIX also offers three choices: Small Amount, Average Amount, Great Amount. This column refers to the number of times the task is performed, and could mean daily, weekly or monthly.

EXAMPLE:

Duty No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount
1	0	BRAKE SYSTEM								
	1	Fill master cylinder with proper fluid	X		X				X	
	2	Use pressure tank to bleed system		X		X			X	
2	0	TUNE-UP								
	1	Use strobe light to align degree pointer	X		X					X
	2	Use dwell meter to adjust point dwell	X			X			X	

The ENTRY LEVEL column has always posed a problem for the analyst. Many analysts like to say how it should be, not how it actually is. It must be understood that this refers to a prerequisite for employment; understanding here greatly facilitates the completion of the inventory.

APPENDIX D

Learner Module Cover Format

COVER FORMAT

OF

LEARNER MODULES

developed under contract
for the State Department of Education

OREGON STATE DEPARTMENT OF EDUCATION
INSTRUCTION DIVISION
CAREER and VOCATIONAL EDUCATION

Since the State Department of Education quite often contracts with local educational agencies to develop state curriculum materials, it is required that the cover and overall appearance of these materials be similar and include the appropriate date for the state agency. These guidelines are an attempt to clarify many questions which arise from time to time regarding module formats. This is not intended to limit the creative process of any individuals under contract but to merely standardize developmental procedures.

Recommended Cover Format

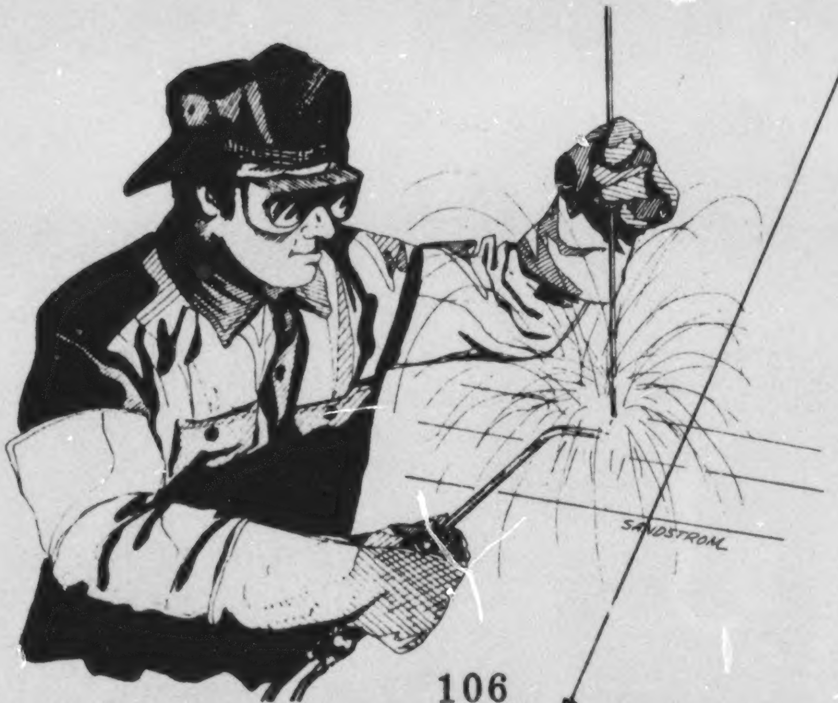
W 2006 THE OXYGEN AND ACETYLENE REGULATORS

ILS

INDIVIDUALIZED
LEARNING
SYSTEMS

Welding

Filing of the modules often causes difficulties since some teachers file them in a cabinet and others in pigeon hole slots. It is recommended the module title and number be included on the right-hand side and lower section of the module.



OREGON DEPARTMENT
OF EDUCATION
942 LANCASTER DRIVE N.E.
SALEM, OREGON 97310

W 2006 THE OXYGEN AND ACETYLENE REGULATORS

Recommended Reverse-side of Cover

OREGON DEPARTMENT OF EDUCATION
942 LANCASTER DRIVE N.E.
SALEM, OREGON 97310

VERNE A. DUNCAN
SUPERINTENDENT OF PUBLIC INSTRUCTION

Since different teams develop and revise the curriculum materials, it is suggested the "original team" be listed and when the materials are revised the latter team be included as so designated, ie.: 1975 Development Team.

ORIGINAL DEVELOPMENTAL TEAM:

Project Coordinator and Writer:
Don Isaacson
Clackamas Community College

Writers:
Thomas Arthur
Lane Community College

Robert Dallas
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Portland Community College

Gerald Slind
Estacada High School

Illustrations by:
Steven Sandstrom

Host Institution:
Clackamas Community College
Oregon City

SUMMER '75 DEVELOPMENTAL TEAM:

I L S

INDIVIDUALIZED LEARNING SYSTEMS

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State Department of Education

Welding

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This module dated

Copyright information should appear on this inside cover

For a new copyright: Copyright, 1975 Oregon State Department of Education

Revised copyright: The original copyright title must appear and then the revised date, ie: Copyright, 1974 Clackamas Community College and Oregon Board of Education; Revised 1975

The State Department of Education will be responsible for obtaining the copyright.

Standard note to be included on all modules.

To eliminate confusion as to whether a module is the latest copy, the module should be dated and each time it is revised, the date changed.

MODULE NUMBERING

Overview

Historically speaking, "module" numbering has been determined by workshop personnel to meet their own individual needs. This has resulted in a variety of unrelated numbering systems which make correlation of our growing curriculum materials quite difficult.

The numbering system presented here will bring some order into the assignment of future numbers and will provide a formula for re-numbering of existing learner modules (packages) where that becomes feasible.

Formula

$$\underbrace{00}_{\text{Alphabetical Prefix- tied to Curriculum title}}-\underbrace{0000}_{\text{Four Basic Numbers}}-\underbrace{000}_{\text{Dash numbers (letters) as needed.}} \leftarrow \text{New Numbering Sequence}$$

Note:

1. Avoid alphabetical prefixes that are already in use. Consult current ILS lists to determine present usage.
2. Consider color coding of sections within one curriculum area if these are not too numerous.
3. Always submit numerical choices to the SDE, Curriculum Development Unit prior to final decision, to avoid any possibility of unnecessary duplication.

Examples

ILS Learning Modules (current or under development)	Past Numbering	Recommended Numbering
Auto-Body-Fender Repair	10,001 to 10,588	AB 1001 to AB 1588
Auto Mechanics	0,000 to 10,000	AM 0000 to AM 1000
Bookkeeping	000 to 2,110	B 000 to B 2110
Construction	37-1 to 2,300-18	C 0037 to C 3000
Drafting	1.00 to 54.0	DR 1.00 to DR 0000
Electronics	0.02D to 9.690	E 0.000 to E 9.999
Food Service		FS 0000 to FS 0000
Forestry Tech		FT 0000 to FT 0000
Home Economics	1 to 59	HE 0001 to HE 0100
Horticulture		H 0001 to H 0000
Industrial Mechanics	001-A to 1101-A	IM 0000 to IM 0000
Law Enforcement		LE 0000 to LE 0000
Metals (Machine Shop)	1 to 817	MS 0000 to MS 0000
Welding	1000 to 5000	W 1000 to W 5000

APPENDIX E

Guidelines for Module Format

GUIDELINES FOR MODULE FORMAT

OREGON STATE DEPARTMENT OF EDUCATION
INSTRUCTION DIVISION
CAREER and VOCATIONAL EDUCATION

LEARNING MODULE SYSTEM
BASIC FORMAT

1. TITLE AND MODULE NUMBER

The title should be a short, descriptive, inviting statement of the contents of the module.

2. PURPOSE

This is the rationale, in the student's terms, indicating why he should learn the contents of this module. One paragraph should be enough.

3. TESTS (PRE)

All of the tests for each module should be as equivalent forms of the same test. The pre-test should be a regular part of the learning module and should be taken before the student starts on the module. If the student scores at the criterion level, he should skip the module. The criterion level may be set by the individual teacher. In some cases, levels of 80% are sufficient; other times, 100% may be required. It must be made clear to the student in either a general statement (for all modules) or specific statements (for each module) how well he is expected to do on each item. He may elect to use the module to learn the parts of the pre-test that he did not perform at level on or he may elect to do the entire module. All of the tests should reflect exactly the competencies of the module. Answers for the pre- and post tests should be available from the instructor. Self test answers should be in the module.

4. LEARNING OUTCOMES

The learning competencies should be stated in behavioral terms. The competencies should be broken down into performance indicators. Performance indicators contain two basic elements:

1. The type of performance expected of the learner.
2. The conditions under which the performance will be measured.

5. DIRECTIONS

Specific instructions for proceeding in each individual module should be stated.

There may be a standard statement such as:

Directions: Complete the following learning opportunities in any order you wish. You may take the self test whenever you feel ready.

or

Directions: You should complete items 1, 2, and 3 in sequence and then do any of the other learning activities you wish.

It is important to help the student see exactly how to proceed when he picks up a module.

6. LEARNING OPPORTUNITIES

A. This is a listing of the activities a student may engage in to learn the above competencies). The activities should be as diversified as possible and provide for a broad range of interest and ability levels. The Information Summary Sheet should be listed as one of these learning opportunities.

B. Reasons, in student terms, for each learning activity should be clearly stated. This helps the student decide exactly which learning activities he will do.

Areas to consider for (A) and (B):

SOURCES	REASONS
Materials: Textbooks. periodicals, pamphlets. laboratory experiments, worksheets, information sheets, exercises, charts, projects, etc.	Clearly sumarize what is presented in each activity. See sample below:
Media: Films, filmstrips records, tape recordings, film loops, video tapes, pictures, etc.	
Methods: Large groups for media, small group for discussions, teacher-pupil conference, individual research in resource center, etc.	

6. LEARNING OPPORTUNITIES (cont'd)

Sample:

	SOURCES	REASONS
Grob:	Applications of Electronics pg. 33-35	This gives a general description of how a transistor amplifier circuit processes the signal.

7. INFORMATION SUMMARY

All concepts required to meet the objectives should be clearly and concisely explained in the module. This explanation should serve as a summary of the ideas the student is asked to learn in the module. Additional references are specified under Learning Opportunities. These should be selected to supplement the Information Summary statement. Each module needs to be a complete source of information for the student. This summary should be listed as one of the learning opportunities.

8. SELF TEST

This should be constructed as described under pre-test. Be sure to make the pre-,post, and self tests as equivalent forms of the same test. The self test should be a regular part of the learning module. Answers to all self test questions should be in the module

9. POST TEST

See pre-test and self-test. For each item of the post-test, there should be instructions for additional information, or what to do to relearn, if the question is missed.

OPTIONAL

1. A pre-test might be given for the following unit to see if the person may have picked up enough additional information to ekip the next module. This can be done for systems that are designed on the linear model.

2. For parallel designed learning systems, the student should be given a list of choices for which he is qualified at the conclusion of each module.

3. Quest: Activities may be defined that take the student beyond the stated objectives. These activities can lead the student to other closely related topics of into greater depth in the topic being studied. Quest is an optional activity.

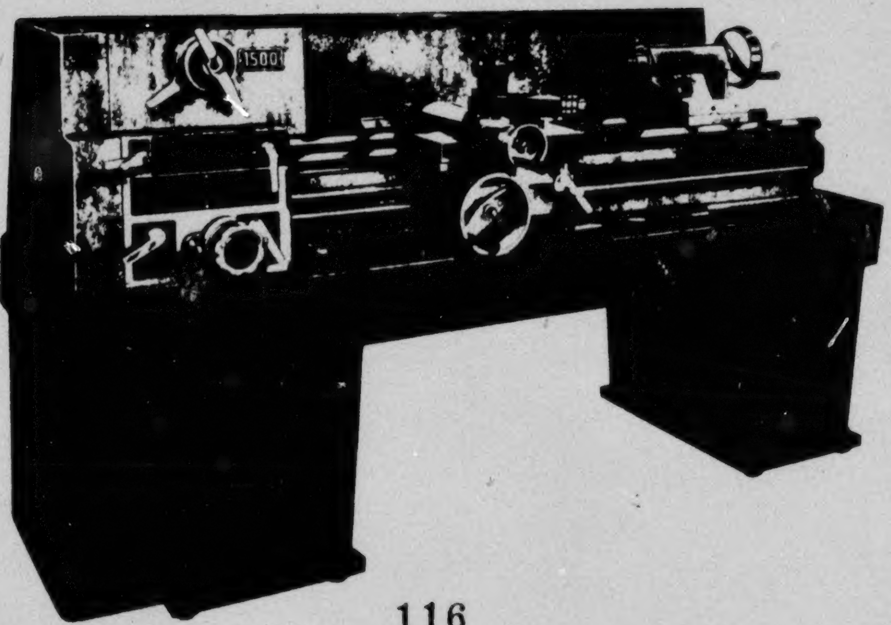
APPENDIX F
Sample Module

ILS

INDIVIDUALIZED
LEARNING
SYSTEMS

Machine Shop

Lathe Operations



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VERNE A. DUNCAN
SUPERINTENDENT OF
PUBLIC INSTRUCTION

MS-3009 THE FOUR-JAW CHUCK

MS-.009 THE FOUR-JAW CHUCK

PURPOSE

The four-jaw chuck is also called the independent chuck, as each jaw may be moved independently of the other. A machinist must know how to accurately center a workpiece in a four-jaw chuck.

OBJECTIVE

Assigned a lathe and a four-jaw chuck you will be able to clean and install a four-jaw chuck and accurately center a workpiece.

LEARNING ACTIVITIES

You will need to do the following to complete the requirements of this learning module successfully:

1. References
2. Information
3. References
4. Media
5. Self-test
6. Post-test

REFERENCES

Research the following terms in reference books in your technical library:

1. The Independent chuck
2. Removing and mounting chucks

MEDIA

MS-3009-01 - Film - Slide/Cassette - "The Four-Jaw Chuck"

INFORMATION

The four-jaw chuck is also called the independent chuck, as each jaw may be moved independently of the others. This characteristic makes possible the secure holding of uneven or unsymetrical parts. It is particularly useful when holding square or rectangular parts. Round pieces, such as shafting, may be set up or adjusted to the center by using a dial indicator so there is very little runout. A round part set-up with this method can be more accurately centered than by using the average three-jaw chuck which, when worn, may be from .002 inches to .010 inches off-center. (Fig. 1)

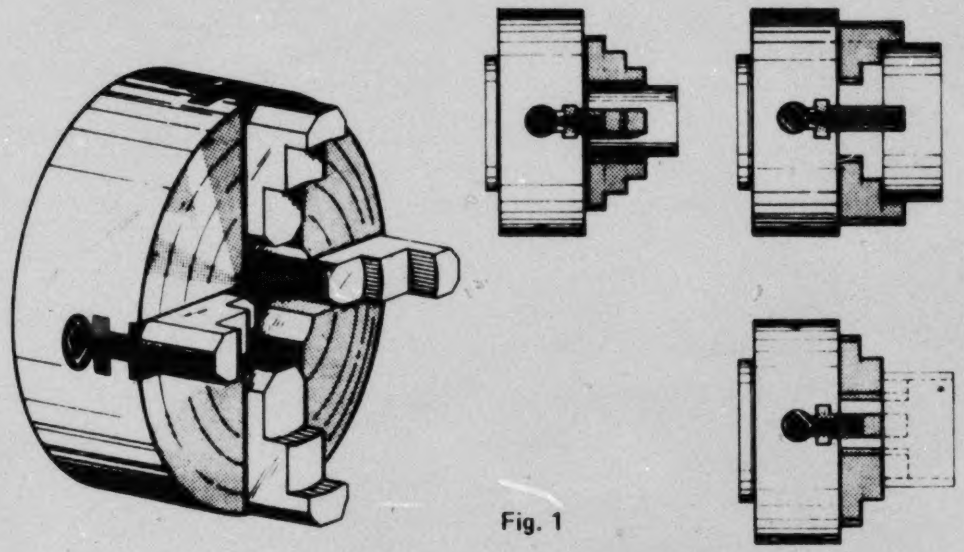

Fig. 1

Each jaw in an independent chuck may be removed and reversed so that a larger diameter piece may be held in the chuck. In some cases, only one or two jaws may be reversed to accommodate an irregular shape. See Figure 1.

It is a known fact that a four-jaw chuck will hold a piece of material much more securely than a three-jaw Universal Chuck. But, this does not mean that material can be extended any further out of the four-jaw chuck than that of a three-jaw. By following the rule-of-thumb-, which states that material should never be extended from the chuck-face over three times the diameter of the material being machined. The lathe operator will avoid the possibility of chatter or vibration developing during a turning operation. The only exception to this rule would be in a situation where a center drilling operation is being performed, a steady rest is used, or the material being turned is supported by a center in the lathe's tailstock. (Fig. 2)

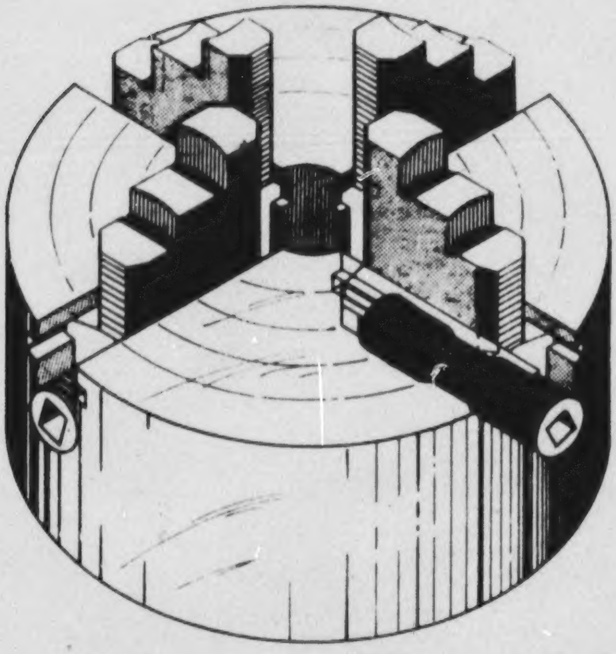

Fig. 2

Centering Material in the Four-Jaw Chuck

Since the jaws of a four-jaw chuck have a tendency to hold more securely directly below their adjusting screw than they do at the tips of the chuck jaw, a piece of material will not always be held in perfect alignment with the center line of the chuck and lathe. For this reason, it is always advisable when centering a piece of material in the four-jaw chuck to place the toolholder, dial indicator, chalk, etc., as close to the chuck as possible for the initial centering operation. Once the centering of the material has been completed at this point, a second centering operation can be performed out at the end of the material as shown in Fig. 3.

The only basic difference between the second centering operation and that of the first is the jaws of the chuck will not have to be adjusted. The end of the material can be tapped lightly with a soft hammer which should position it in relation to the center line of the chuck. After centering of the material has been completed, a center drilling operation can be performed so that a tailstock center can be used to give the material support during a turning operation.

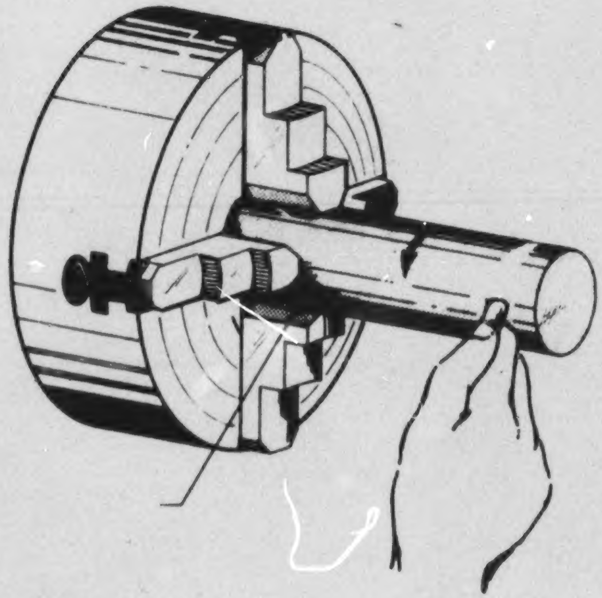

Fig. 3

Mounting the Four-Jaw Chuck on the Lathe

1. Before installing the four-jaw chuck on the spindle nose of a lathe, place a lathe board over the ways of the lathe for protection.
2. Clean the spindle nose of the lathe thoroughly with a clean rag to remove any chips, dirt, or grease.
3. Finish cleaning the spindle nose with your fingers to remove any lint or small chips. Check for small burrs and remove them if necessary, but only under the supervision of your instructor.
4. Place the four-jaw chuck on the lathe board and clean it with a clean rag.
5. Run your fingers over the machined surface of the chuck to determine if there are any chips or small burrs remaining.
6. Once the chuck has been mounted and secured to the spindle nose of the lathe, you can begin to chuck-up and center various shaped materials.

Setup No. 1 - Centering Rough Round Stock Using a Tool Holder

The following procedure is designed primarily to be used on material with a rough surface. If accurate centering of smooth material is necessary, follow the procedure described in Setup No. 2 - Centering Smooth Round Stock Using a Dial Indicator.

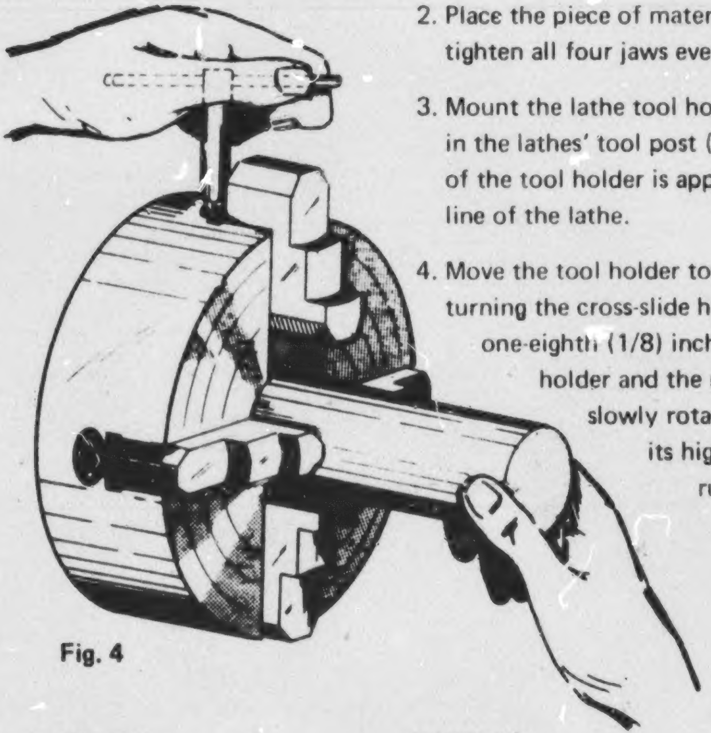

Fig. 4

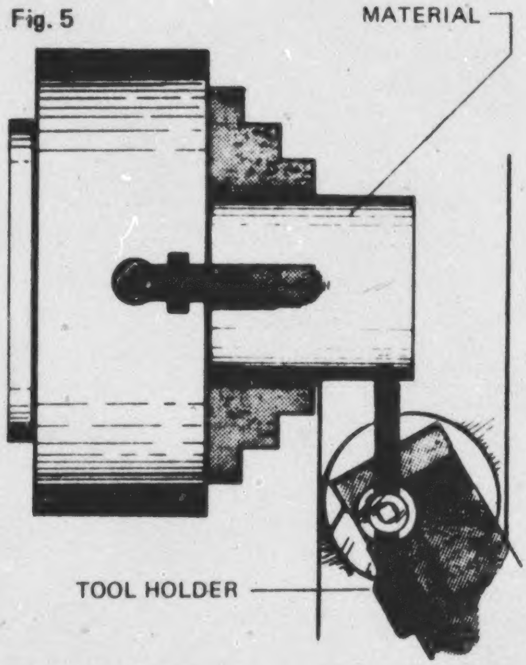

Fig. 5

1. Set the chuck jaws to the materials' approximate diameter by using the concentric rings on the chuck face.
2. Place the piece of material between the chuck jaws and tighten all four jaws evenly with a chuck wrench, Fig. 4.
3. Mount the lathe tool holder backwards and upside-down in the lathes' tool post (Fig. 5). Be sure the upper edge of the tool holder is approximately even with the center line of the lathe.
4. Move the tool holder toward the chucked material by turning the cross-slide handwheel. Leave approximately one-eighth (1/8) inch between the tip of the tool holder and the material. This will allow you to slowly rotate the chuck by hand to determine its high point or that with the furthest run-out, without the material striking the end of the tool holder
5. It should be mentioned that the point on the material with the furthest run-out may not always fall in direct line with any one of the four jaws, but somewhere in between two of them. If this results, use the nearest jaw at the point with the furthest run-out.
6. Once the point on the material with the furthest run-out has been located, move the tool holder forward until it just barely makes contact with the material.
7. Rotate the chuck through a second complete revolution to visually determine the materials' run-out.
8. After determining the material's run-out, rotate the chuck so the jaw which is directly opposite that with the furthest run-out is in an accessible

9. Loosen this jaw and back it out approximately 1/2 of the material's run-out.

10. Rotate the chuck back around to the jaw that indicates the furthest run-out. By tightening this jaw down, the material will be moved toward the center of the chuck.

11. Once the adjustment of the chuck has been completed, it will be necessary to repeat this process again until the material is withint the desired tolerance.

NOTE: It should be mentioned that this same procedure can be carried out with the aid of any solid object similar to a tool holder, such as: a tool bit, parting tool, etc. Also, be sure that all four of the chuck jaws are secure before turning the lathe spindle ON.

Setup No. 2 - Centering Smooth Round Stock Using a Dial Indicator

1. Set the chuck jaws to the material's approximate diameter by using the concentric rings or the chuck face.
2. Place the piece of material between the chuck jaws and tighten all four jaws evenly with a chuck wrench.

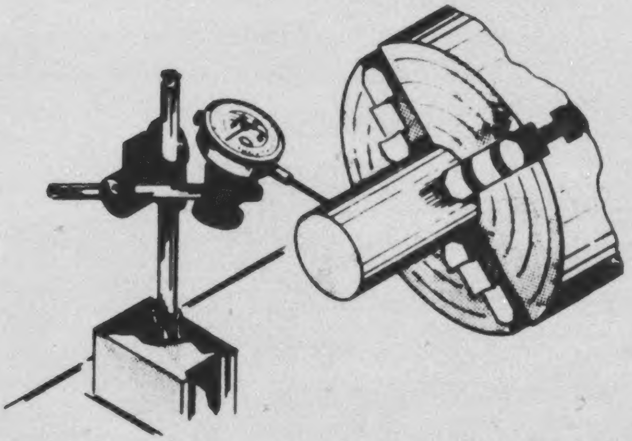

Fig. 6

3. Select a dial indicator which has approximately 0.200" travel. An indicator with this amount of travel will be less susceptible to damage by a part being too far out-of-round than a dial indicator with only 0.030" travel.
4. If a magnetic base is used with a dial indicator, (Fig. 6) it may be attached to the ways of the lathe, its carriage, or cross-slide. Another commonly used practice is to lay a smooth piece of flat steel across the ways of the lathe, just under the material that you are dialing in. Then attach the magnetic base to the steel plate. (Be sure you do not damage the ways of the lathe when laying the piece of steel across them.)
5. If a magnetic base is not available, it will then be necessary to attach the dial indicator to the lathes' toolpost, tool holder, tool bit, or any other solid object that will give it vibration-free support.

6. Bring the foot of the dial indicator into contact with the material. Rotate the chuck through several complete revolutions so that you can see the total movement of the indicator needle. If you are unable to see the complete movement of the indicator needle from its high to low point, move the dial indicator closer to the material, or check the material run-out.

7. Once you can see the full swing of the indicator needle, make a notation as to the total movement in thousandths of an inch. (It may be helpful to set the indicator's zero marking at the needle's lowest point.)

8. Return to the point on the material that indicated the furthest run-out. If this point should fall between two chuck jaws instead of directly in line with one, rotate the chuck so that the foot of the dial indicator is in line with the nearest jaw.

9. Rotate the chuck 1/2 revolution so that the jaw which is directly opposite that with the largest run-out is in an accessible position.

10. With the aid of a chuck wrench, loosen this jaw and back it out approximately 1/2 of the material's total run-out.

11. Slowly rotate the chuck back to the jaw with the largest indicated run-out. With the aid of a chuck wrench tighten this jaw down. By tightening this chuck jaw you will move the piece of material closer to the center of the chuck.

12. Now, locate the next-highest point on the material (which may be near the two remaining jaws) and repeat the entire process again until the material is within the desired tolerance.

NOTE: Do not use a dial indicator on any material that has a rough surface as the indicator may be damaged and not indicate an accurate reading. Also, make sure that all of the chuck jaws are secure before starting the lathe spindle.

Setup No. 3 - Centering Rectangular Material With a Tool Holder

Many times during machining operations we are required to position various shaped material in the four-jaw chuck. Figure 7 shows an example of a rectangular piece of material positioned in the four-jaw chuck with the aid of a tool holder.

1. Open the four jaws on the chuck to the approximate dimensions of the material. Remember to use the concentric rings on the chuck face as a guide to the position of the jaws.
2. Place the material in the jaws of the chuck. With the aid of a chuck-wrench, tighten the jaws. Position the material as close to the center of the chuck as possible. This will help reduce the time required to center the material.
3. Position the tool holder upside-down and backwards in the tool holder. Try to keep the upper edge of the tool holder close to the center line of the lathe.
4. Rotate the chuck so that any one of the material's four sides is facing the tool holder and is positioned vertically (Fig. 7).

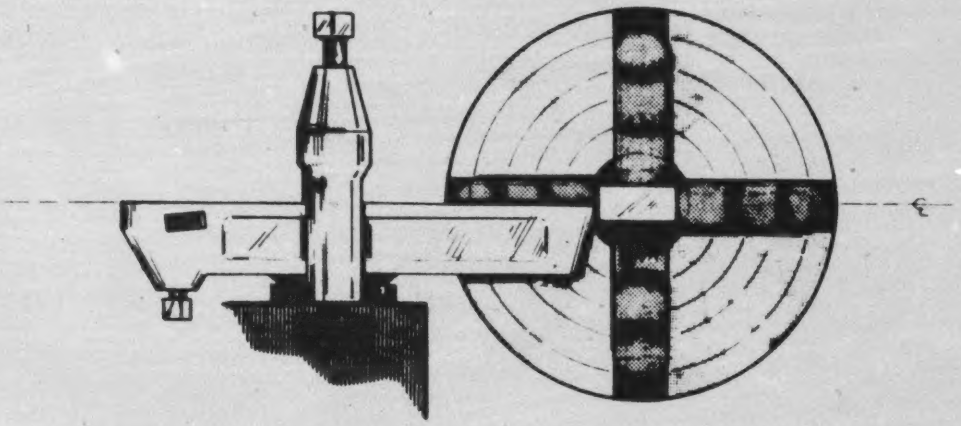

Fig. 7

5. Move the tool holder forward by means of the cross-slide handwheel until it just barely touches the material.
6. Loosen the cross-slide micrometer collar and set it at zero, (Fig. 8).

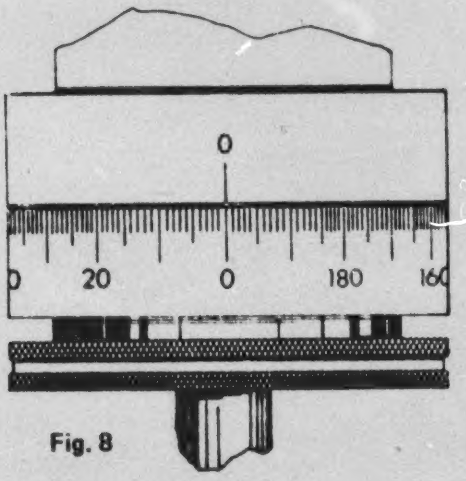

Fig. 8

7. Back the tool holder away from the material so that the material can be rotated without striking the tool holder.

8. Rotate the chuck 1/2 revolution so that the opposite side of the material is now in position facing the tool holder. Move the tool holder forward by means of the cross-slide handwheel until its tip just barely touches the material.

9. Look at the micrometer collar on the cross-slide to determine if the indicated zero has reached the fixed scribe line on the collar, or has gone past it. This will indicate whether or not this side of the material is the furthest from the center of the chuck, or whether the opposite side is the furthest from the chuck center.

10. In this example, Figure 9, we see that the reading on the micrometer collar is 160, with a maximum reading on the collar of 200. This tells us that we are forty-thousandths of an inch away from our original zero setting.

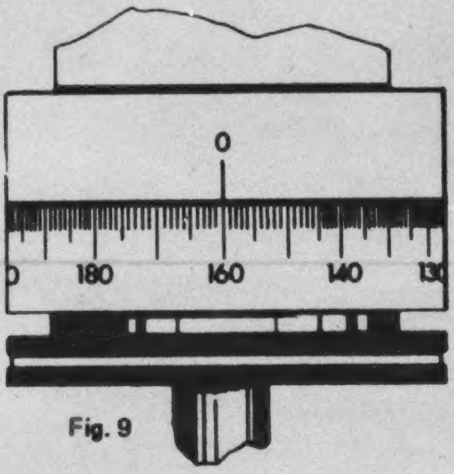

Fig. 9

11. Back the tool holder away from the material and rotate the chuck as that the jaw which is opposite that with the 40 thousandths of an inch run-out is in an accessible position. Loosen the jaw with a chuck wrench and back it out one half of the material's run-out or twenty-thousandths of an inch.

12. Rotate the chuck back around so that the jaw with the largest run-out is in an accessible position. With the aid of the chuck wrench, tighten this jaw down. This will move the material toward the center of the chuck.

13. Repeat the procedure until these two edges of the rectangular piece of material have the same reading on the cross-slide micrometer collar.

14. Once these two edges are withint the desired tolerance, do not apply excessive pressure to the chuck jaws as you still have the two remaining edges to center. If excess pressure is applied to the first set of jaws, it may become impossible to move the material toward the center of the chuck when aligning the two remaining sides of the rectangular material.

NOTE: If more accuracy is needed than can be obtained with a tool holder, a dial indicator can be used. Also, before turning the lathe spindle ON, be sure each of the four chuck jaws is secure.

Setup No. 4 - Chucking Material Internally -

1. With the chuck jaws in their normal position move them outward so they measure on the outside, approximately the same size as the inside diameter of the material to be chucked.
2. Hold the material firmly against the jaws while adjusting each jaw outward until the material is held securely by all four jaws. (Fig. 10)

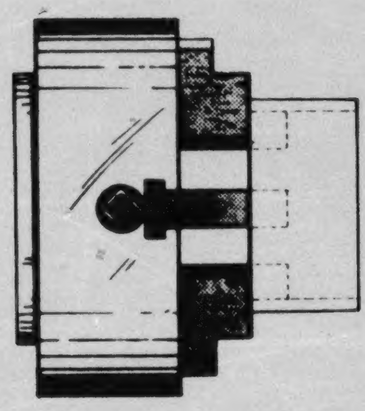

Fig. 10

3. Use whatever method is necessary to bring the material into the required tolerance.

NOTE: Do not apply any more pressure than necessary to hold the material as it may become bent or deformed if it is of thin-walled material. Also, do not use a dial indicator on any material with rough or scale surface.

Setup No. 5 - Chucking Material Externally With Reverse Jaws -

1. Reverse the chuck jaws one-at-a-time. Be sure that you replace each of the chuck jaws from the same slot that it was removed.

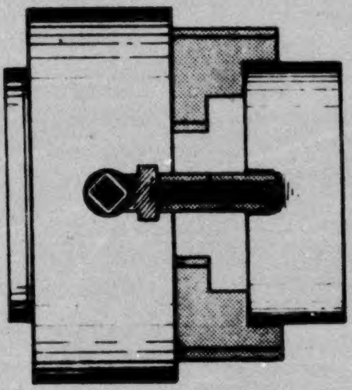

Fig. 11

2. Position the chuck jaws to the approximate outside diameter of the material with the aid of the concentric rings on the chuck face.
3. Place the material inside the chuck jaws, and hold it securely while closing the jaws. (Fig. 11)
4. Use whatever method is necessary to bring the material into the required tolerance.

NOTE: Do not apply any more pressure than necessary to hold the material as it may become bent or deformed if it is of thin-walled material. Also, do not use a dial indicator on any material with rough or scale surface.

SELF-TEST

1. What characteristic makes it possible for a four-jaw independent chuck to hold uneven or unsymetrical parts?

2. Will a three-jaw chuck hold a workpiece as securely as a four-jaw independent chuck?

3. When doing chucking work that is not supported by a steady-rest or tailstock center, how far into the jaws of the chuck should you insert the piece of material?

   A. just enough to hold on to the material
   B. no more than half way into the jaws
   C. as far into the jaws as possible
   D. none of the above

4. If a workpiece is off-center in a four-jaw chuck, you would move it toward the center of the chuck:

   A. by moving the jaw on the high side toward the center
   B. by moving the jaw on the low side toward the center
   C. tighten the jaw on the high and low side
   D. none of the above

5. Approximately how accurately can you center a piece of material by using the tool holder method?

6. ______________ may have a tendency to develop if the material that is being turned, extends too far beyond the jaws of the chuck.

SELF-TEST ANSWER KEY

1. Each jaw is able to move independently of all the rest.

2. No - More holding pressure can be applied to each jaw of a four-jaw independent chuck than the jaw of a three-jaw universal chuck.

3. As far into the chuck as possible.

4. A.

5. + 1/64"

6. Vibration or chatter

POST-TEST

NAME ____________________ DATE ____________________

1. What disadvantage might you find in using a four-jaw independent chuck over that of a three-jaw universal chuck?

____

____

2. When using a dial indicator on a piece of material held in a four-jaw independent chuck, the indicator should be placed where?

   A. away from the chuck, and toward the end of the material.
   B. as close to the chuck jaws as possible without endangering the indicator.

3. A dial indicator should never be used on material which has a ____________________

____

4. The ______________________ on the face of the four-jaw chuck can be used to position the chuck jaw in relation tot he diameter of the material.

5. To center a piece of round stock:

   A. you should tighten the jaw over the low side.
   B. you should tighten the jaw over the high side.
   C. you should tighten the jaw 90 degrees from the high side.
   D. none of the above.

6. Which chuck will hold work most securely?

   A. four-jaw chuck
   B. both are about the same
   C. three-jaw chuck
   D. none of the above

7. Once you have completed the above portion of the Post-test, your instructor will have you setup and center two pieces of material, by any of the setups discussed in this learning package.

POST-TEST ANSWER KEY

1. Generally more time consuming to adjust than three-jaw universal chuck.
2. B.
3. rough surface
4. concentric rings
5. B.
6. A.
7. Your instructor will evaluate the accuracy of your setup.

APPENDIX G
Sample Work Experience Training Plan

MECHANIC

GENERAL AUTOMOTIVE

STUDENT PROGRESS RECORD & WORK EXPERIENCE PROGRAM

TRAINING PLAN

DATES: From ________ To ________________

DOT NUMBER 620.281 014

USOE NUMBER 17.030200

NAME OF STUDENT ____________________

NAME OF FIRM ____________________

NAME OF SCHOOL ____________________

INSTRUCTIONS:

This training plan includes those tasks which are most often performed by the

GENERAL AUTOMOTIVE MECHANIC

In order to design a personalized training plan for the individual student check only those tasks which will be included in the training to be offered by the employer. Also indicate by a check mark those items of related information to be learned "in school" or "on the job".

As each assigned task is observed, practiced, and performed, the appropriate column should be initialed by the employer to indicate the degree of proficiency attained by the student.

AUTOMOBILE MECHANIC D.O.T. 620.281 014 U.S.O.E. 17.030200

Automobile man; garage mechanic; garage repairman. Repairs and overhauls automobiles, buses, trucks, and other automotive vehicles: Examines vehicle and discusses with customer or AUTOMOBILE REPAIR - SERVICE SALESMAN; AUTOMOBILE TESTER; or BUS INSPECTOR nature and extent of damage or malfunction. Plans work procedure, using charts, technical manuals, and experience. Raises vehicle, using hydraulic jack or hoist, to gain access to mechanical units bolted to underside of vehicle. Removes unit, such as engine, transmission, or differential, using wrenches and hoist. Disassembles unit and inspects parts for wear, using micrometers, calipers, and thickness gages. Repairs or replaces parts, such as pistons, rods, gears, valves, and bearings, using mechanic's handtools. Overhauls or replaces carburetors, blowers, generators, distributors, starters, and pumps. Rebuilds parts, such as crankshafts and cylinder blocks, using lathes, shapers, drill presses, and welding equipment. Rewires ignition system, lights, and instrument panel. Relines and adjusts brakes, alines front end, repairs or replaces shock absorbers, and solders leaks in radiator. Mends damaged body and fenders by hammering out or filling in dents and welding broken parts. Replaces and adjusts headlights, and installs and repairs accessories, such as radios, heaters, mirrors, and windshield wipers. May be designated according to specialty as AUTOMOBILE MECHANIC, MOTOR; BUS MECHANIC; DIFFERENTIAL REPAIRMAN; ENGINE-REPAIR MECHANIC, BUS; FOREIGN- CAR MECHANIC; TRUCK MECHANIC.

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
A. Inspecting/ Analyzing		1. Conduct spot checks on malfunctions.				Orientation to Employer's Business		
		2. Inspect tires and wheels.				Manufacturer's Specifications		
		3. Inspect/test windshield wiper motors, blades, arms.				Employer's shop rates and policies.		
		4. Inspect glass for defects				Inspection report forms.		
		5. Inspect vehicles for physical damage - (exterior, interior)				Estimating practices or techniques. Mathematics of estimating.		
		6. Prepare inspection reports.						
		7. Estimate cost of vehicle repairs.						
B. Maintenance Control		1. Complete forms when servicing vehicles.				Employer's report forms & policies		
		2. Complete time cards.				Legible writing or printing		
		3. Complete parts/materials requisitions.						
		4. Enter work performed on work orders.						
		5. Complete service record cards.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
C. Engine Maintenance/ Repair/Overhaul		1. Adjust valves 2. Clean engines 3. Clean engine parts and check for condition. 4. Diagnose valve train and head malfunctions. 5. Disassemble engines. 6. Fit piston pins. 7. Grind valves. 8. Inspect and correct bearing fit. 9. Inspect exhaust systems. 10. Inspect head for warp. 11. Inspect or replace exhaust manifolds. 12. Inspect crankshaft and connecting rod assembly using micrometers and other equipment. 13. Machine valve guides for special seals. 14. Perform cylinder balance test. 15. Perform cylinder leakage test.				Safety & Cleanliness Internal Combustion Engine Theory Technical manuals - interpreting Manufacturers specifications Measuring Instruments Small Hand Tools Power tools Welding Special tools Angular Measurement Fundamentals of Applied Physics Special equipment Tolerances (decimals, fractions, etc.) Lubricants		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
C. (continued)		16. Perform operational inspections of positive crankcase ventilation systems.						
		17. Perform operational inspections of engine lubrication systems.						
		18. Remove engines from vehicles.						
		19. Repair oil pumps.						
		20. Replace connecting rods and bearings.						
		21. Replace crankshaft and bearings.						
		22. Replace engine mounts.						
		23. Replace flywheel						
		24. Replace flywheel ring gears.						
		25. Replace gaskets and seals						
		26. Replace muffler.						
		27. Replace oil pumps.						
		28. Replace pan and valve covers.						
		29. Replace pistons.						
		30. Replace rings on pistons.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
C. (continued)		31. Replace tail pipe assemblies.						
		32. Replace timing gears and chains.						
		33. Replace valves						
		34. Replace valve guides.						
		35. Replace valve seats.						
		36. Repair or service crankcase ventilation systems.						
		37. Replace valve lifters.						
		38. Resurface valve seats.						
		39. Replace camshaft.						
		40. Replace camshaft bearings						
		41. Run compression test.						
		42. Weld small holes and cracks in blocks.						
D. MAINTAIN/REPAIR Power Trains		1. Adjust external shift linkage on manual transmissions.				Mechanical Power Transmission Theory		
		2. Adjust mechanical type clutch.				Fundamentals of simple machines.		
		3. Inspect shifting.				Manufacturer's specifications		
		4. Inspect drive shaft				Technical manuals - interpretation.		
		5. Inspect drive shafts, u-joints, center bearings				Lubricants		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
D. (continued)		6. Lubricate speedometer cable, drive gear, and housing.				Fundamentals of hydraulics Mathematics of Ratios & Proportions.		
		7. Lubricate universal joints				Mathematics of simple formulas		
		8. Perform operational inspections of differentials				Concept of the differential		
		9. Perform operational manual transmission inspections.				Tolerances (decimals, fractions)		
		10. Rebuild manual transmission (major repairs)				Special tools and equipment.		
		11. Repair hydraulic type clutch.				Measuring instruments. Angular measurement.		
		12. Repair or replace differentials.				Concept of the friction clutch.		
		13. Repair or replace spider gear.				Safety and cleanliness		
		14. Repair or replace slip joints or universal joints.						
		15. Repair, replace, or adjust front-drive axle assemblies.						
		16. Replace mechanical type clutch.						
		17. Replace drive line seals.						
		18. Replace a manual transmission						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
D. (continued)		19. Replace manual transmission gaskets and seals (in-car repairs).						
		20. Replace pinion seal.						
		21. Replace pilot bearings.						
		22. Replace rear-axle shaft, bearings and seal.						
		23. Replace speedometer cable, drive gear, and housing.						
		24. Replace throw-out bearings.						
		25. Replace transmission mounts.						
		26. Road test inspections of differentials.						

circuit.

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Perform with supervision	Perform without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
E. MAINTAIN/REPAIR Automatic Transmission		1. Adjust floor shift linkage. 2. Adjust linkage from steering column to automatic transmission. 3. Clean and visually inspect transmission. 4. Diagnose, replace or adjust modulators. 5. Inspect and repair transmission cooling system. 6. Inspect and repair converter. 7. Inspect and repair front pump and components. 8. Install automatic transmission coolers. 9. Make external adjustment of bands on automatic transmissions. 10. Make internal repairs and adjustments on automatic transmissions. 11. Perform operational automatic transmission inspections. 12. Remove and install automatic transmission.				Manufacturer's specifications Technical Manuals - interpretation Mathematics of simple formulas Fundamentals of hydraulics Safety and cleanliness Special tools and equipment Concept of automatic transmissions. Concept of torque conversion Measuring instruments. Pressure guages Concept of fluid pressure, flow, etc. Fluids and lubricants.		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
E. (continued)		13. Replace external seals, gaskets, and lines on automatic transmissions.						
		14. Replace or adjust neutral switch.						
		15. Service automatic transmission.						
		16. Service filter and check transmission cooling system.						
F. MAINTAIN/REPAIR								
Electrical Systems		1. Adjust headlights.				Electrical terms & symbols		
		2. Adjust, repair, or replace backup light switches.				Circuits & Circuit Requirements.		
						Magnetism		
		3. Analyze or adjust engine performance using engine analyzer.				AC and DC theory		
						Electrical test equipment		
		4. Analyze malfunctions in the cranking system.				Simple Algebraic Formulas		
		5. Clean, gap, and test spark plugs.				Batteries		
						Charging circuits		
		6. Inspect secondary circuit leads, plug wires, distributor cap, and rotor.				Starting Circuits		
						Ignition systems		
		7. Inspect and repair ignition switch, resistor, wiring, coil, points, & condenser of the primary				Lighting circuits		
		brake inspections.				brake rotors brake linings		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
F. (continued)		8. Locate and repair shorts and open circuits in wiring.				Accessories: Radio, Heater, Air Conditioner, Cigarette lighters, Cruise Control, turn signals etc. Circuit Diagrams Technical Manuals Manufacturer's specifications Safety and cleanliness		
		9. Measure resistance in plug wires.						
		10. Perform operational inspections of electrical systems.						
		11. Perform operational inspections of lighting systems.						
		12. Repair or replace charging systems.						
		13. Repair distributors.						
		14. Repair generators or alternators.						
		15. Repair or replace fuse block assembly.						
		16. Repair or replace lighting system components.						
		17. Repair or replace switches.						
		18. Repair solenoids.						
		19. Repair starters.						
		20. Repair windshield wiper mechanisms or controls.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
F. (continued)		21. Replace and adjust distributors.						
		22. Replace chassis and under hood wiring.						
		23. Replace flasher units						
		24. Replace generators or alternators.						
		25. Replace light bulbs.						
		26. Replace starters.						
		27. Replace stop-light switch.						
		28. Replace turn signal switches.						
		29. Service or replace batteries, cables, and battery boxes.						
		30. Set ignition timing.						
		31. Strobe distributors, modify or correct advance curves.						
		32. Test and repair cruise control units.						
		33. Test and repair turn signal units.						
		34. Test and rewire dash units.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task —	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
G. MAINTAIN/REPAIR								
Fuel Systems		1. Adjust carburetor.				Operating principles:		
		2. Clean carburetor.				Carburetor & choke system		
		3. Clean or replace fuel filter units.				Fuel pump		
						Fuel tank & cap		
		4. Inspect, clean and adjust choke unit (automatic & manual).				Fuel lines and filters		
						Air cleaner		
		5. Inspect, service, or replace carburetor air cleaner.				Manifolds		
						Evaporation controls		
		6. Inspect, service, or replace gas tank, cap and sending unit.				Servicing/repair/replacement of components		
		7. Install carburetors.				Allied fundamentals of Physics		
		8. Measure fuel flow and pressure.				Fuel system mathematics.		
		9. Perform operational inspections of exhaust emission control systems.				Safety and cleanliness. Cleaning of parts.		
		10. Perform operational inspection of fuel systems.						
		11. Remove, service, or replace fuel pumps.						
		12. Repair or replace fuel lines and hoses.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
G. (continued)		13. Repair or service carburetors.						
		14. Repair or service exhaust emission control systems.						
		15. Service or replace manifold head controls.						
		16. Service or replace units in vacuum systems.						
H. MAINTAIN/REPAIR								
Cooling Systems		1. Check coolant freezing point.				Cooling systems theory		
		2. Check coolant temperature.				Temperature conversions		
						Heat transfer		
		3. Check overflow tank and accessories.				Soldering principles		
		4. Chemically clean and flush cooling system.				Anti freeze		
						Cooling system chemicals		
		5. Inspect, adjust, and replace fan.				Expansion/Contraction of liquids		
		6. Inspect water hoses.				Pressures - high/low		
		7. Remove and reinstall radiators.				Boiling points of liquids.		
		8. Replace freeze plugs.				Related mathematics		
		9. Replace heater hoses.				Heat vs. temperature		
		10. Replace radiator hoses.				Properties of liquids		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
H. (continued)		11. Replace variable-speed fan.				Manufacturers specifications		
		12. Replace water pump.				Technical Manuals - interpretation		
		13. Solder minor leaks in radiator.						
		14. Test and replace coolant pressure caps.						
		15. Test and replace thermostat.						
I. MAINTAIN/REPAIR Steering Units		1. Adjust worm and sector.				Related fundamentals of Physics:		
		2. Inspect and replace steering spindles.				the screw and worm		
		3. Inspect steering				lubricants		
		4. Lubricate the power steering				angular measurement		
						mechanical advantages		
		5. Lubricate the steering box and linkage.				pressure in liquids		
		6. Rebuild power steering cylinder.				properties of liquids		
						pumps		
		7. Repair or replace manual steering components.				steering components		
		8. Repair or replace power steering components.				alignment of components		
						manufacturers specifications		
		9. Repair or replace power steering pumps.				Technical manual - interpretation.		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
I. (continued)		10. Repair or replace tilt and telescoping and collapsible mast jackets						
		11. Replace belts and set tension.						
		12. Replace pivot points on power steering linkage.						
		13. Replace pivot points on steering linkage.						
		14. Service filter in power steering.						
J. MAINTAIN/REPAIR								
Brake Systems		1. Adjust brakes.				Hydraulic system fundamentals:		
		2. Adjust hand brake linkage.				Pressure in fluids		
		3. Bleed brakes.				Residual pressures		
		4. Free up parking brake cables.				Mechanical advantages		
						Power assistance		
		5. Inspect and replace brake pads. (disc brakes)				Safety and cleanliness		
		6. Inspect and turn rotor if necessary. (disc brakes)				Mathematics of hydraulic systems.		
		7. Inspect and turn brake systems.				Atmospheric pressure and vacuum.		
		8. Inspect, repair or replace self adjusters.				properties of materials:		
		9. Perform operational				brake drums		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
J. MAINTAIN/REPAIR								
Brake Systems		10. Recondition backing plates.				Manufacturers specifications Technical manual - interpretation		
		11. Reline brake shoes.						
		12. Repair disc brakes.						
		13. Repair or replace master cylinder.						
		14. Repair or replace hydraulic power brake units.						
		15. Repair or replace hydraulic control valves.						
		16. Repair or replace hydraulic lines and fittings.						
		17. Repair or replace wheel cylinder.						
		18. Replace brake shoes.						
K. MAINTAIN/REPAIR								
Front Ends		1. Adjust or replace torsion bars.				Front end theory: Caster/camber/toe-in		
		2. Adjust and repack front wheel bearing.				Toe-out on turns		
		3. Balance wheels and tires.				Spring height		
		4. Inspect and align front end.				Angular measurement Alignment		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
K. (continued)		5. Inspect and align rear end.				Manufacturer's specifications		
		6. Inspect and replace steering damper.				Technical manuals - interpretation		
		7. Inspect wheel bearings.				Safety and cleanliness		
		8. Inspect and repair front suspension systems.						
		9. Lubricate ball joints.						
		10. Lubricate the front and rear suspension.						
		11. Perform visual inspections of suspension systems.						
		12. Rebush king pins or link pins.						
		13. Repair or replace rear suspension system.						
		14. Replace ball joints.						
		15. Replace front wheel.						
		16. Replace front suspension control arms and bushings.						
		17. Replace shock absorbers.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
L. MAINTAIN/REPAIR								
Heaters		1. Diagnose heating system malfunctions.				Heat transfer fundamentals		
						Properties of liquids		
		2. Inspect and replace thermostat.				Heater controls		
		3. Inspect and replace defroster hose.				Temperature sensors		
						Manufacturer's specifications		
		4. Replace heater water control units.				Technical manuals - interpretation		
		5. Remove and repair or replace heater core.				Safety and cleanliness		
		6. Service heater control components.				Soldering principles		
		7. Service or replace circulating heaters.						
M. MAINTAIN/REPAIR								
Air Conditioners		1. Inspect and refill system with freon.				Heat transfer fundamentals		
						properties of liquids		
		2. Diagnose air conditioning malfunctions.				properties of gases		
		3. Install air-conditioners in vehicles.				compressor fundamentals		
						condenser fundamentals		
		4. Pressure test, performance test, and leak test system.				evaporator fundamentals		
						dryer fundamentals		
		5. Repair or replace air conditioning compressor				manufacturer's specifications		

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
M. (continued)		6. Repair automatic a/c and heater systems vacuum and electrical units.				Technical manuals - interpretation Safety and cleanliness Temperature conversions Related mathematics Pressures - high/low Seals and gaskets		
		7. Repair compressor shaft seals.						
		8. Replace compressor seals.						
		9. Replace condensor in air conditioning unit.						
		10. Replace air conditioner fan motor.						
		11. Replace evaporator in air conditioning unit.						
		12. Replace dryer in air conditioning unit.						
		13. Replace expansion valve in air conditioning unit.						
		14. Replace freon control valve or diaphragm in air conditioning unit.						
		15. Service air conditioner control cables and switches.						

JOB:	CHECK THOSE TASKS TO BE EMPHASIZED	TASKS:	Observed task -	Performs with supervision	Performs without supervision	RELATED TECHNICAL INFORMATION	LEARNED IN SCHOOL	LEARNED ON THE JOB
N. MAINTAIN/REPAIR								
Lubrication, etc.		1. Change of oil and filters				Types of lubricants		
		2. Inspect and clean automobile interiors.				Types of fuels		
		3. Lubricate vehicles and equipment.				Lubrication charts, etc.		
		4. Remove, repair or replace tires.				Changing/servicing tires		
		5. Perform road service.				Winterizing services		
		6. Pick up stalled vehicles.				Manufacturer's specifications		
		7. Service vehicles with fuel or oil.				Safety and cleanliness		
		8. Maintain tire removal equipment.						
		9. Maintain washrack equipment.						
		10. Winterize vehicles.						

APPENDIX H
Miscellaneous Tables

Table IV
MANPOWER SUMMARIES
FOR
COMPETENCY-BASED OCCUPATIONAL GROUPINGS*

TITLES	DATES
Summary of Occupational Employment Trends in the Marketing Cluster	1974
Summary of Occupational Employment Trends in Health Occupations	1974
Summary of Employment Trends in the Food Service Occupations	1975
Summary of Occupational Trends in the Office Occupations	1974
Summary of Occupational Employment Trends in the Industrial Mechanics Cluster	1973
Summary of Employment Trends in the Construction Occupations	1975
Summary of Occupational Employment Trends in the Electricity-Electronics Occupations	1973
Summary of Occupational Employment Trends in the Metals Cluster	1974
Summary of Employment Trends in the Child Care, Clothing, and Institutional and Home Management Occupations	1975
Summary of Occupational Employment Trends in the Graphic Communications Occupations	1973**
Summary of Occupational Employment Trends in Service Occupations Cluster	1974
Summary of Employment Trends in the Forest Products Occupations	1975
Summary of Employment Trends in the Agricultural Occupations Planned for	1976

*Published by the Oregon Department of Education, Career and Vocational Education Section, Salem, Oregon 97310

**Drafting occupations and estimated employment and projected need were not included in the Graphics Manpower Summary, but are available upon request. Present plans are to include the drafting occupations in the second edition of the manpower summary for the graphics occupational areas.

TABLE 9

GUIDES DEVELOPED OR REVISED DURING PROJECT PERIOD INCLUDING COMPILATION OF COMPETENCIES AND PERFORMANCE OBJECTIVES

CLUSTER	NEW	REVISED
Electricity/Electronics		X
Service Occupations	X	
Marketing		X
Steno-Clerical		
Real Estate	X	

Table VI
WORK EXPERIENCE TRAINING
PLANS DEVELOPED DURING PROJECT

OCCUPATION	D.O.T. NUMBER	USOE NUMBER
AUTOMOTIVE		
General Auto Mechanic	620.281 014	17.030200
Air Conditioning Mechanic	620.281 010	17.039900
Automatic Transmission Mech.	620.281 098	17.030300
Automotive Brake Mechanic	620.281 034	17.030300
Automotive Electrical Mech.	825.281 030	17.030300
Service Station Attendant	915.867 010	
Engine Tune-up Mechanic	620.281 106	17.030300
Front End Alignment Mech.	620.281 062	17.030300
Radiator Repair Mechanic	620.381 010	17.030300
Small Engine Repair Mech.	620.381 086	17.31
Lubrication Man-Automotive	915.887 014	17.039900
FOOD SERVICE		
Busboy/Busgirl	311.878 010	17.2904
Cook	318.381 018	17.290200
Cook's Helper	317.887 010	17.2902
Cook - School Cafeteria	313.381 018	17.290200
Cook - Short Order Cook	314.281 010	17.290200
Counterman/Countergirl	311.878 022	17.290400
Host/Hostess	310.868 010	04.0700
Kitchen Helper	318.887 010	17.2999
Sandwichman/Sandwichgirl	317.884 022	17.290200
Waiter/Waitress	311.878 058	17.2904
OFFICE OCCUPATIONS		
Bookkeeper	210.388 022	14.0102
Clerk,General Office	219.388 066	14.0303
Clerk Typist	209.388 022	14.0901
Receptionist	237.368 038	14.0406
Secretary,General Office	231.368 018	14.070200
Stenographer	202.388 014	14.070300

Table VII
OCCUPATIONAL TASK ANALYSIS COMPLIED DURING PROJECT PERIOD

SUBJECT AREA	USOE OCCUPATION GROUP	D.O.T. NUMBER/TITLE
Marketing	Advertising Service	164 168 010 Account Executive
	Automotive Sales	280 358 014 Salesman, Auto
	Finance & Credit	186 168 046 Operations Officer
	Food Distribution	299 468 010 Cashier-Checker
	General Merchanidise	299 138 022 Manager,Department
		289 458 014 Salesperson, Genera
	Hardware	276 358 010 Salesman, Building Supplies
	Industrial Markeing	289 358 014 Salesman, General
	Insurance	250 258 014 Life & Health Ins. Fire & Casualty Ins
	Real Estate	250 358 026 Salesman, Real Esta
		250 358 026 Broker, Real Estate
	Dist. Ed., Other	162 158 102 Purchasing Agent
	Shipping & Receiving	222 387 026 Shipping/Receiving Clerk
	Stock & Inventory Clerk	223 387 094 Stock Clerk
Industrial Mechanics	Mechanic	620 281 014 Automobile Mechanic
	Small Engine Mechanic	620 281 086 Motorcycle Repairma (Small Engine Mechanic)
	Business Machine Maintenance	633 281 030 Office Machine Serviceman
	Maintenance, Heavy Equipment	620 281 046 Construction Equipment Mechanic
	Cooling	827 381 022 Refrigerator Mechanic
Electricity/ Electronics	Electricity	824 281 014 Electrician Manufacturing Maintenance Elect. Construction Elect.
	Electronics Tech.	003 181 014 Electronics Tech.

OCCUPATIONAL TASK ANALYSIS
COMPLIED DURING PROJECT PERIOD

SUBJECT AREA	USOE OCCUPATION GROUP	D.O.T. NUMBER/TITLE
Electricity/ Electronics (cont'd)	Electrical Appliances	827 281 014 Electrical Appliances Serviceman
	Electronics Occup.	726 781 010 Electronics Assembler
	Radio and Television	720 281 010 Radio Repairman
	Radio and Television	720 281 018 TV Service & Repair
Service Occupations	Hotel Lodging	187 118 030 Hotel Manager
	Transportation	242 368 014 Travel Clerk
	Cosmetology	332 271 010 Cosmetologist
	Law Enforcement	375 268 040 Patrolman
	Law	119 288 020 Legal Assistant
	Information Commication Occupations	248 368 050 Library Assistant
	Educational Assistants & Training Specialist	009 368 014 Teacher Aide
Real Estate	Real Estate	Developer/Builder
	Commercial Real Estate	Investment Counselor
	Real Estate	Leasing & Property Management
	Real Estate Broker	Broker, Marketing
	Real Estate Appraiser	191-287-010 Appraiser
	Real Estate Title & Escrow Officer	169-388-010 Title & Escrow Officer
	Real Estate Broker	Farms, Ranches Recreational Real Estate, Sales
	Real Estate	Residential Real Estate, SAles